Power Equipment Usage Manual

(Revision: May 2010)

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REVISIONS

All suggested changes, edits and/or additions to this document should be submitted in writing by one of the following methods:

a. Email changes, edits and/or additions (please be specific) to:

"Sun City Texas Woodworkers Club" <Sun_City_Texas_Woodworkers_Club@mail.vresp.com>

b. Bring a hardcopy or computer disk to the Woodshop and give it to the Shop Monitor.
   - This can be either, pages marked up in **RED** (please) from this manual, or new written material.
   - Please also provide your name and contact information in case there are any questions.
   - Notify the following that it is there for pickup, or be sure to clearly mark the front with "EQUIPMENT MANUAL EDITS" so that it will be noticed:

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1. INTRODUCTION

1.1. Purpose of Woodworkers Club

The purpose of the Woodworkers Club, a Chartered Club of Sun City Texas, is to encourage and support the craft of woodworking among its members by sponsoring programs, exchange of information about woodworking and other relevant activities. It is also our responsibility to fund and manage safe operations of the Woodshop for use by its members in Sun City Texas. The Club bylaws can be found at: http://www.sctxwoodshop.com/bylaws.htm .

1.2. Purpose of Document

The purpose of this document is to provide fundamental information on how to setup and use the power tools in the Woodshop properly, safely and effectively. It is intended to not only further enhance your personal safety but also the safety of your fellow woodworkers in the shop working around you. Additionally, the safe and proper operation of the Woodshop equipment will ensure they are maintained in optimal condition.

1.3. Scope & Organization of Document

This document presents fundamental information on using the Woodshop, the steps necessary to setup each machine provided by the Woodshop and how to perform the basic operation that machine is typically used for. This document is not intended to be a complete training manual covering all potential equipment uses and situations and does not address common powered/unpowered hand tools normally found in one's own home. More specifically:

- **Section 2:** Discusses the general safety rules of the Woodshop one must follow and provides additional common sense advice.
- **Section 3:** Presents information on additional training and informational resources both within the Woodshop and external.
- **Section 4:** Tells one how to prepare a board to get it flat and square.
- **Sections 5 through 30:** Begin with the pieces of equipment used to prepare a board, the Jointer and the Planer, followed by the saws. The rest of the Woodshop equipment is presented in alphabetical order.
- **Section 31:** Discusses the Woodshop recommended procedures and rules on Glue-ups.

1.4. Document Photography

In this document, the blade guard was removed in some photos for photographic purposes only.

2. SAFETY – GENERAL

The WOODSHOP SAFETY POLICY is to keep all the blade guards in place – for the table saws, for the band saws, for the jointer. If an operation requires the removal (or disabling) of a guard, they must be replaced (or restored) immediately after the operation is complete.

2.1. Woodshop Rules on Attire & Recommended Safety Gear

When in the Woodshop, it is important that the woodworker be dressed appropriately.

Woodshop Rules on Proper Attire: *When working around any type of operating equipment:*

- *Avoid wearing loose fitting clothes. If wearing long sleeve shirts, they must be tight fitting sleeves or you must roll the sleeves up above the elbows.*
- *Do not wear ties or long straps around your neck when operating machinery.*
- *Remove loose fitting watches, jewelry, and any loose items in shirt pockets.*
- *The use of loose fitting work gloves are not allowed when operating machinery. The use of any gloves is strongly discouraged when operating machinery; however, tight fitting (golf, batting, woodworking) gloves may be worn at the user's discretion.*
- *Closed toe shoes must be worn in the shop.* ***SANDAL TYPE SHOES ARE NOT PERMITTED****.*
- *Long hair MUST be secured so that it does not obstruct vision or risk becoming entangled in equipment.*
- *Eye protection should be worn at all times when operating electric and/or air driven machine, hand tools or working on any operation that can produce dust or metal particles.*
- *Hearing protection should be worn when working around machines that are especially noisy.*
- *ID badges must be attached to clothing via a close fitting clip or other devise that will prevent the badge from hanging down in such a manner as to create potential contact with any shop equipment.*
    - *Lanyard type badge holder, if worn, must be worn inside the shirt while in the shop.*
    - *If a suitable attachment device is not available for the badge, then the badge shall be removed while in the shop and a temporary badge shall be made from tape with the person's name written on it and attached to the wood worker's shirt or blouse while working in the Woodshop.*

Recommended Gear: The following are not required by the Woodshop, but are recommended:

- **Safety Glasses:** First and foremost, when working with any woodworking tools, we recommend the wearing of safety glasses. For many operations small pieces of stock can be propelled in nearly any direction. Even worse, if a blade breaks, the possibility exists that a piece could come loose. Your eyesight is too valuable to take chances to be woodworking without protective eye wear. Develop the habit of wearing your safety glasses at all times.

  There are numerous styles of safety glasses. Try out the many styles that your woodworking supplier offers, and find a pair that you'll be comfortable wearing. Be certain that the pair you choose incorporates impact resistant lenses and side screens to protect against debris created by your power tools.

- **Hearing Protection:** While some machines are not loud enough to require hearing protection, operations on the jointer and planer and router are particularly loud and can damage your hearing. There are many types of hearing protection available at the local hardware stores or from your woodworking supplier. Find one that is comfortable and consider wearing them whenever you are near these machines, even if someone else is the operator.

- **Face Shield:** A face shield is a good idea when wood turning, as chips tend to fly in any direction. A clear, impact resistant full-face shield will keep these flying chips and debris out of your face, helping you to avoid distraction when turning.

- **Respirators:** When turning some woods or sanding, particularly fine imported woods such as mahogany or rosewood, it is advisable to wear a dust mask or even a respirator, as the fine dust generated by these woods can cause irritation to the lungs and mucous membranes. Prolonged exposure to such dust may cause some long-term effects.

2.2. Other Common Sense Suggestions

As with any power tool, always read and follow the safety instructions. Failure to follow the safety instructions can lead to severe injury to yourself, your fellow woodworkers and/or the equipment and can even lead to death.

ALWAYS APPROACH a piece of machinery as if it is running!

THE MOST RELIABLE SAFETY DEVICE is your own sense of danger: If you encounter a situation that seems risky, there is a good chance it is if for no other reason than you are concerned about it. Stop and think the task through AND ASK FOR HELP if you need it. There is usually an alternative way of doing nearly any cut that is safer and often more effective. Take your time and concentrate on what you are doing. No cut or project is worth risking an injury.

AVOID DISTRACTIONS: When working with woodworking machinery, do everything you can to avoid distractions. If someone tries to interrupt you while making a cut, do not avert your eyes from the tool;

finish the cut or turn off the equipment before diverting your attention. Too often, injuries occur because the operator was distracted, even for only a moment.

DON'T FLICK WOOD PIECES with your Finger: When using a saw, there will often be very small pieces of stock that are cut off during the cutting process. Do not attempt to flick these away from the blade with your fingers. Use another piece of stock or a push stick, preferably with the blade stopped. Often this is not necessary, as the next cut will push the piece safely away from the blade. Once it is clear, push it off of the table. However, never leave loose pieces on your table that could impede your cut.

DO NOT ALLOW FAMILIARITY (gained from frequent use of equipment) **TO REPLACE SAFETY RULES**. Always remember that a careless fraction of a second is sufficient to inflict severe injury.

OBTAIN ADVICE from the Shop Monitor or another qualified person if you are not thoroughly familiar with the operation of any Woodshop machine. Knowledge is safety.

BASIC RULES THAT APPLY TO ALL EQUIPMENT:

- INSPECT WOOD for loose knots or embedded foreign objects (nails, staples, etc.) to prevent kick-back or damage to the equipment. Remove items or discard board. ***(IF you damage the equipment because of nails, staple, rocks etc.., you'll have to pay for their repair)***
- AVOID KICK-BACK by supporting the wood piece adequately at all times and by maintaining control of the work.
- HOLD THE WORKPIECE FIRMLY against the table or fence. Loss of control of the workpiece can cause kick-back and result in serious injury.
- PROPERLY SUPPORT LONG OR WIDE WORKPIECES. Loss of control of the workpiece can cause injury.
- NEVER TURN A MACHINE "ON" with the workpiece contacting the cutterhead. Kick-back can occur.
- NEVER TURN THE MACHINE "ON" before clearing the table of all objects (tools, scraps of wood, etc.). Flying debris can cause serious injury.
- AVOID AWKWARD OPERATIONS AND HAND POSITIONS. A sudden slip could cause a hand to move into the cutterhead.
- NEVER PERFORM LAYOUT, ASSEMBLY, OR SET-UP WORK on the table/work area when the machine is running. A sudden slip could cause a hand to move into the cutterhead. Severe injury can result.

3. TRAINING & WOODSHOP USAGE

3.1. Additional Training & Information

If you are not thoroughly familiar with the operations of a particular machine or tool, obtain advice from a shop Monitor or seasoned woodworker.

The reader is encouraged to:

- Attend additional training classes provided by the Woodworkers Club
- Seek out advice from the Shop Monitor or other woodworkers
- Read books and magazines and research the Internet for additional information
- Read the Equipment Manuals stored in the Shop Monitor's desk

3.1.1. Classes & Instructors

We have an evolving set of classes that is taught by experienced members of the Woodshop. Class schedules and sign-up sheets are located at the Shop Monitor's station. There is a minimal charge for some of the classes.

Many classes are not scheduled until there are enough people signed up to warrant a class, while some have a fixed schedule set. Classes that are on a set schedule include Monitor Training and Safety Orientation. Classes that are arranged when enough people have signed up include: picture frame making, box making, raised panel doors making with the shaper, splicing with the shaper, cabinet making and project design. Requests for additional classes should be forwarded to a member of the Board for consideration.

Specialized classes are required before using the following tools:

- Shaper for raised panel doors
- Shaper for finger joints
- Timesaver Drum Sander
- Powermatic Lathe

3.1.2. Woodshop Library

The Woodshop maintains a library of woodworking books, videos, and periodicals for use by our members. These can be found in the Meeting Room and many subjects are covered:

- Ideas for woodworking projects

- Patterns for many projects
- Specifics about wood tools and power equipment
- Jigs
- Wood carving
- Finishing

While not every issue of each periodical is available, many are. Periodicals and an *index* (blue binder and on computer) for ideas, projects, and specific plans include:

- *American Woodmaker*
- *Fine Woodworking*
- *Popular Woodworking*
- *ShopNotes*
- *Workbench*
- *WOOD*
- *Woodsmith*
- *Woodworker's Journal*

A computer is available in the library that contains the *Woodworker's Guide*, a database of periodicals that allow members to search by project name.

All members are encouraged to utilize the library, however we ask that:

1) If you remove material from the library, please leave a note with your name, what you removed and the date.
2) You must return it the next day and replace it in its proper location (we do not have a librarian and it is only a courtesy to put the material back for the next woodworker).

If you have personal copies of any of the missing volumes, we welcome them in the library.

Finally, remember that these periodicals are for all members to use. Removal of an issue for any purpose is only allowed overnight.

3.1.3. Recommended Internet Sites

The Internet has proven to be a priceless asset to woodworkers through the sharing of information on personal web sites and dedicated forums. Here are just a few recommended websites, many more web links can be found on the Woodworkers Club website:

- ***About.com:*** http://woodworking.about.com/od/safetyfirst/Using_your_Woodworking_Tools_Safely.htm
- ***American Woodworker Magazine:*** http://www.americanwoodworker.com
- ***Newwoodworker.com Tips & Tricks:*** http://www.newwoodworker.com/tipstrksdir.html
- ***Popular Woodworking Magazine:*** http://popularwoodworking.com
- ***Woodsmith, ShopNote & Workbench Magazines Woodworker's Forum***:

  http://www.woodnet.net/forums/
- ***WOOD***: http://www.woodmagazine.com/
- ***Woodcraft Magazine:*** http://woodcraft.com/
- ***Workbench:*** http://www.workbenchmagazine.com/
- ***Woodworker's Journal***:

  http://www.woodworkersjournal.com/index.cfm/articles

  http://www.woodworkersjournal.com/index.cfm/QuikLinks

3.2. Equipment Repair & Maintenance

The Maintenance Team alone is responsible for maintaining all machines and tools in good working order.

The Woodshop is closed to woodworkers on the first Saturday of every month for scheduled maintenance by the Maintenance Team.

Members can change blades, but MUST NOT attempt to repair a malfunctioning machine. Specifically:

- Should a machine malfunction, REPORT IT to the Shop Monitor who will advise the Maintenance Team to make the needed repairs or adjustments as soon as possible. **The monitor will also take the machine out of operation if the malfunction warrants it.**
- Changing of scroll-saw blades, table saw blades, dado cutters, spindle sander tubes, shaper and router bits by members is expected.
- Members are NOT to repair or replace band-saw blades or replace drum sander belts.
- Members are urged to observe obvious safety precautions when performing any machine setup changes. **Disconnection of the power is a first priority.**

3.3. Woodshop Materials & Processes

See the Club's GENERAL SAFETY PROCEDURES AND RULES on our web site (http://www.sctxwoodshop.com) for additional and more current details of what is and is not allowed.

3.3.1. Forbidden Materials

ONLY NEW/UNUSED WOOD is allowed to be machined in the Woodshop. Therefore, the following is a comprehensive list of materials that are NOT allowed to be machined in the Woodshop:

- Used wood

  NOTE: Lumber with unfound nails, stones, bards, screws, etc. are both an extreme hazard to you as an operator and may cause extreme damage to the equipment!

- Painted wood
- Chemically treated (e.g. pressure treated) wood
- Glass or glass blocks
- Marble
- Metals
- Cement board ("Hardiplank ®" type material)
- PVC

3.3.2. Wood Finishing is Forbidden

No staining, sealing, painting, finishing or burning of wood of any kind is allowed in the Woodshop. The Woodshop does not have the required equipment to eradicate the noxious fumes those products produce.

3.3.3. Storage of Materials

Overnight storage of personal wood and/or projects is permitted only when an individual working on a single project will return the following morning to work on that project. This pertains to all areas inside and outside the Woodshop.

One cannot store wood that will be used for multiple projects even though the individual is in the Woodshop daily. Failure to comply with this policy will result in the wood and/or projects being removed from the Woodshop.

The Board may designate and authorize wood storage areas for club projects.

Further, if you are leaving wood for any reason, you must stow your materials out of the way, and you must leave the following information on a piece of paper taped on the wood (especially important if you leave the shop while your glue is setting up) – information that includes:

1) Your name
2) Your phone number
3) If clamped, an indication as to when the clamps can be taken off (no longer than 4 hours after clamping)
4) An indication as to when you left the shop and when you plan to return

3.3.4. Supplies & Wood for Members

As a convenience to its members, the Woodshop attempts to maintain an adequate supply of small consumables for use by members at the Woodshop.

- The following supplies are stored in the cabinets:
    - For purchase items: Biscuits, Screws, Sandpaper and Scroll Saw Blades. The price is posted on the cabinet door and an honor system money box is provided where the item is stored. A Price List can also be found on the Woodshop website at: http://www.sctxwoodshop.com/machine_inventory.htm
    - No charge items: Nails, Staples, Glue and Large Erasers used for installed sanders.
- You may also bring these supplies from home for your personal use.

The Woodshop obtains lumber from various sources on occasion and offers them to the members for a very small donation:

- An honor system box is provided for members to deposit money for the boards with the suggested donation posted adjacent to or marked directly on the lumber.
- In addition, short boards are stored in a designated area and are provided FREE to all members.
- If you have useable cut-offs that you don't want, please recycle them in the free area for other members' benefit and for Woodshop projects.

3.3.5. Hand Tools Provided

The Woodshop provides hand tools for use in the confines of the shop only; they may not be removed from the Woodshop.

4. How to Prepare a Board

4.1. Reading Grain Orientation

Improper feed direction can ruin the work piece and can represent a danger to the woodworker! The grain must slope away from the cutters edge. Be sure you know which way the cutter is turning!

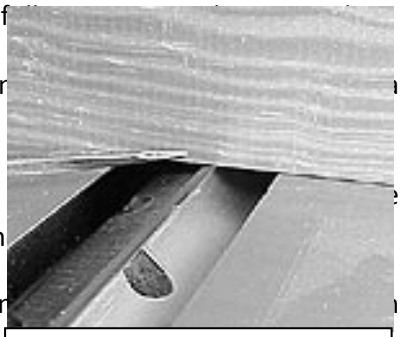
If wood is machined in the wrong direction:

- The edges of grain lines can lift or separate, requiring additional sanding to achieve a smooth surface.
- A cutter can catch the edge of a grain line and may contribute to kickback.
- A cutter can catch the edge of a grain line and may fracture the workpiece.

While present everywhere in wood, the most visible grain is at the growth rings. Because we can readily see growth rings, they are used to determine grain orientation in a piece of wood. If you are uncertain as to the grain orientation, ask someone in the Woodshop for assistance.

To describe the cutter rotation direction versus the grain direction, the f

- When the cutter is working 'down', or 'with the grain', the bur
  smooth surface with minimal defects.
- If the cutter is working 'up', or 'against the grain', the grain can
  could be rougher than anticipated and require considerable san



Cutter working 'down', or 'with the grain'

The portion of the cutter meeting the wood turns against the direction
routers, jointers, planers, table saws and their hand-held equivalents.
making grain direction important in their use as well.

Marking the grain direction noted on both sides of the wood can help prevent mistakes when sending it through a machine (see Section 4.2 below). Very often opposing sides of a board must be fed in opposite directions to maintain proper grain orientation in relation to the cutter.

Occasionally a piece of wood has grain that appears to run parallel to its length. In these cases, correct feed direction can be virtually impossible to determine visually. When in doubt, make an educated guess, followed by close inspection of the freshly machined surface to determine the best direction to feed the workpiece.

- Often one feed direction produces a noticeably smoother surface than the other. Sometimes the difference can be very subtle.

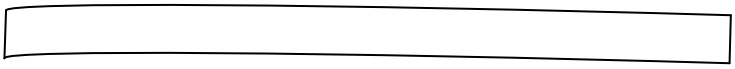
- In the rare instances when feed direction shows no difference, watch the results produced in successive passes as grain orientation usually changes as wood is removed.

The time and effort spent in reading grain orientation in a piece of wood is more than offset by eliminating unnecessary steps in surface preparation and by reducing the potential of a kickback or board fracture. Identifying grain orientation should be one of those "automatic" steps as it improves your projects and can help keep you and your fellow woodworkers safe.

4.2. How to Prepare a Board, or Getting Started

All stock should be squared before before proceeding to the table saw, before gluing and/or detailing and before final dimensioning for assembly.

This is a sketch of a typical piece of wood with the imperfections exaggerated. The point is that most wood is not flat, not flat along the length of the wood and not flat across the wood. And, we need to get it flat.

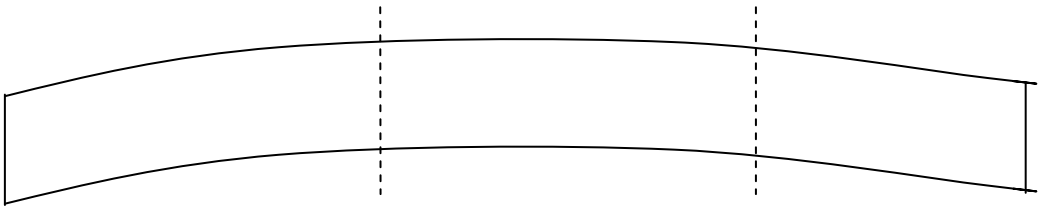


SIDE VIEW
(This is intended to look like wood with a slight warp or bow in it)

END VIEW
(This is intended to look like wood with a slight warp in it)

1) **First, cut boards down to near final dimensions**: to make producing straight, square wood faster and easier on you and the machines. If the board is very much longer or wider than needed, cutting it closer to the needed dimensions can substantially reduce the amount of wood that has to be removed. This both reduces defects and makes them easier to handle.

    - Always cut long boards down, creating workpieces **a minimum of 12" long** and 1" to 2" longer than required for the project. Then, after they are jointed, planed and squared, final trim cuts can be made to get them to their final length with absolutely square ends.



The point is to make a big defect into a much smaller one that is easier to deal with at the jointer.

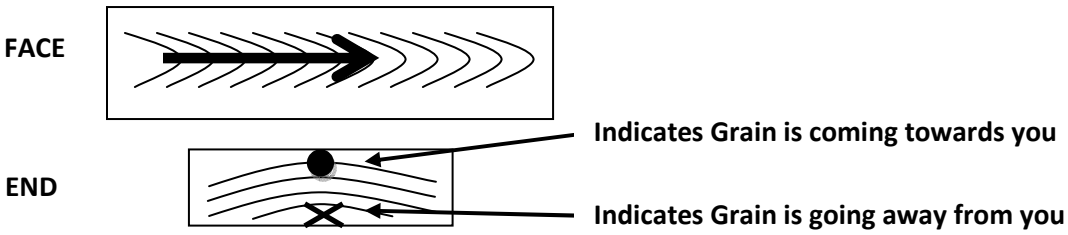
    - If the board is considerably wider than needed, joint the straightest edge and then take it to the table saw and rip it down to the size needed, plus 1/4" to 1/2".

- For bad edges, use a long straight edge or snap a chalk line to mark the edge just inside the defect. Most often this cut line is positioned to minimize the amount of wood to be removed, but it can be also angled slightly so the finished edge is more closely aligned with the grain of the wood. After marking, use a bandsaw, circular saw or jigsaw to remove and straiten the defective edge. Then take the new edge to the jointer to perfect the edge with considerably less effort and loss of wood.

  CAUTION: DO NOT attempt to run a crooked board through a table saw to remove a defect without a straight edge to place against the fence, the risk of a kickback and burning up the saw blade is very high.

2) **Second, flatten one face of board:** First step in getting your board squared is to run one face of the wood [the face that is more concave that the other] through the jointer until that face is flat. *(See Section 5. Jointer for details of how to setup and use this piece of equipment.)*

   - The wood needs to be run length-wise through the jointer. Always remember that your wood has to be **at least 12" long x 3/4" wide AND never joint an edge less than 1/4" thick**. Anything smaller is a safety hazard to you, those around you and can harm the equipment.
   - Start by checking grain pattern of each piece of stock to be jointed. Jointing stock against the grain can cause chipping of the board. (see *Section 4.1 Reading Grain Orientation*)
   - Mark your stock using the arrow method below to indicate grain direction.



3) **Third, flatten one edge of the board and get it square to the flattened side:** Run one edge through the jointer [with the now flat side against the jointer fence] until the edge is flat.

   (NOTE: Before starting this step, be sure to check the jointer fence with a machinists square to ensure the face and edge will be square (90°) to each other. Adjust the fence if necessary.)

4) **Fourth, get the two faces of the board parallel to each other:** Run the wood through the planer [with the now flat side down] until it is smooth. *(See Section 6. Planer for details of how to setup and use this piece of equipment.)*

   - Now your wood is flat and smooth on three sides (two faces and one edge) and these three sides are square to each other.

The next two steps can be performed in either order, just make sure to put the flat face down if you haven't planed the 2nd face of the board!

5) **Fifth, get the second edge parallel to the first edge:** Once the board has three good sides (two faces and one edge), make a rip cut on the fourth side (remaining uneven edge) using the table saw by having the "flattened/squared" edge against the table saw fence. *(See Section 7. Table Saw for details of how to use this piece of equipment.)*

   - You now have a board that has two parallel edges, two parallel faces and the faces and edges are square to each other.

6) **Sixth, thin the board to proper thickness:** To get your wood down to the thickness you need, there are several alternatives:

   - Use the planer to shave it down. This is the typical procedure when only a minimal amount of wood is being removed such as when going from 3/4" to 1/2" (or even 3/8"). ***Proper woodworking procedure dictates that you must never use a planer to extensively reduce the thickness of wood such as going from 1" to 3/8" – this is an unnecessary waste of useable wood.***

     NOTE: Getting wood down to 1/4" or 3/16" requires a backer board. If you don't, the pressure from the planer will: 1) bow the wood and you won't end up with a piece that is uniformly the same thickness, or 2) the piece will fracture under the pressure.

   - If you need to remove a lot of thickness, use the band saw to split the wood and finish getting it to size in the planer. *(See Section 8. on the 15" Band Saw or Section 9. on the 20" Band Saw for details of how to setup and use this piece of equipment.)*

7) **Seventh, the final step is to get the ends square with the rest of the squared board:** Use the miter saw or the table saw with its miter gauge to cut off both ends of the board. *(See Section 10. Miter Saw and/or Section 7. Table Saw for details of how to setup and use this piece of equipment.)*

5. JOINTER, SURFACE (12" General International 80-300M2)

A jointer can machine one face and one edge of a board perfectly flat and straight and square to each other. It cannot make surfaces parallel to each other. That is the job of the thickness planer for surfaces and the job of the table saw for edges.

5.1. Safety Precautions

a. DO NOT perform face jointing operations on stock smaller than 12" long by 3/4" wide, or joint any edges less than 12" long by 1/4" thick.

b. NEVER REMOVE OR DISABLE THE GUARD for ANY operations.

c. INSPECT WOOD for loose knots or embedded foreign objects (nails, staples, etc.) to prevent kick-back or damage to the equipment. Remove items or discard board. ***(IF you damage the knives because of nails, staples, rocks etc.., you'll have to pay for their repair)***

d. AVOID KICK-BACK by supporting the wood piece adequately at all times and by maintaining control of the work.

e. DO NOT back workpiece toward the infeed table. (Follow through and past cutting blades for all cuts!)

f. ALWAYS USE A PUSH BLOCK when jointing a face, or a push stick when jointing an edge if the stock height is less than the height of the fence. *(see photos in next section)*

g. NEVER HAVE YOUR HAND on top of the workpiece when the cutterhead is beneath your hand. Use push tools instead of your hand.

h. NEVER TURN THE MACHINE "ON" with the workpiece contacting the cutterhead. Kick-back can occur.

i. HOLD THE WORKPIECE FIRMLY against the table and fence. Loss of control of the workpiece can cause kick-back and result in serious injury.

j. PROPERLY SUPPORT LONG OR WIDE WORKPIECES. Loss of control of the workpiece can cause injury.

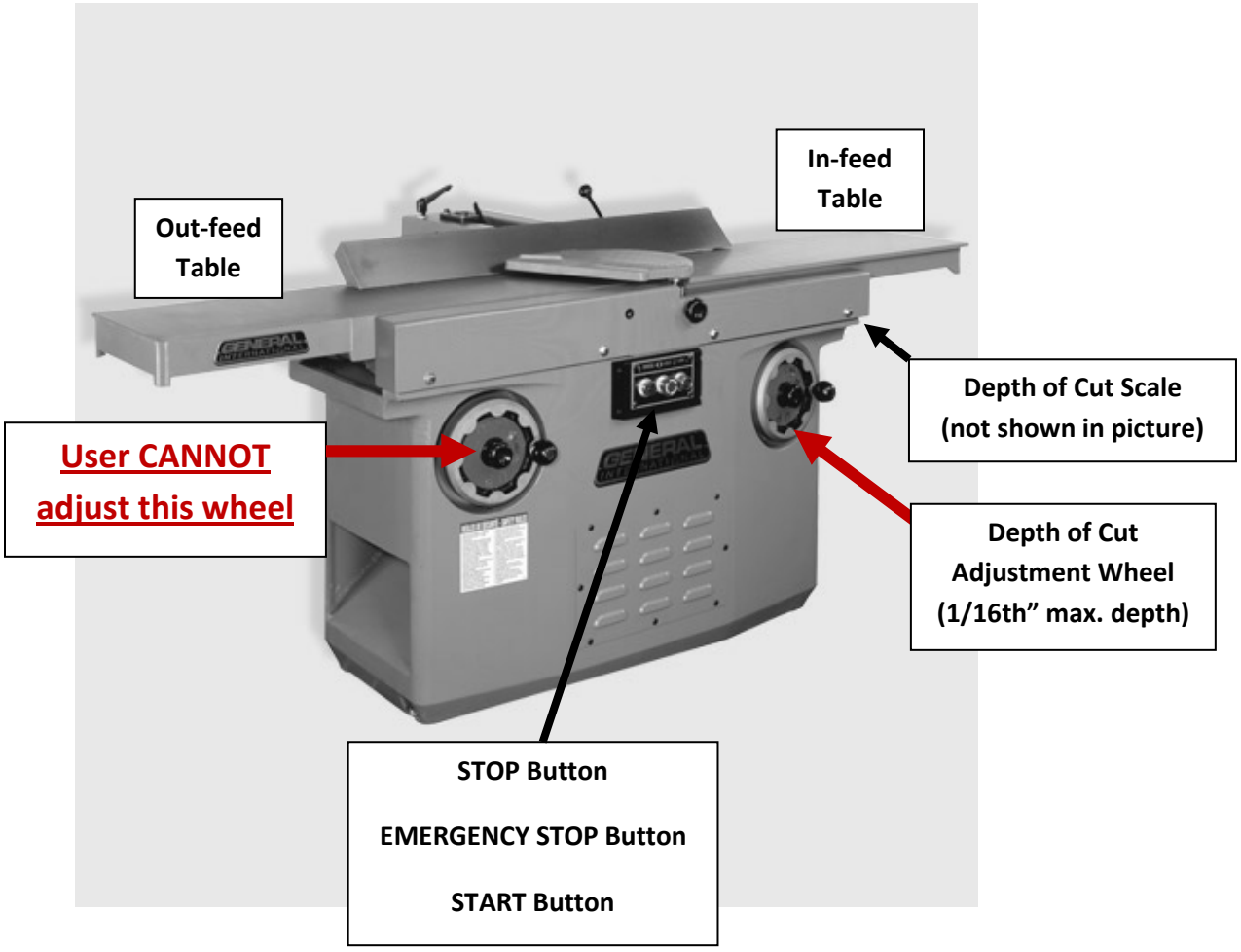
k. NEVER TURN THE MACHINE "ON" before clearing the table of all objects (tools, scraps of wood, etc.). Flying debris can cause serious injury.

l. AVOID AWKWARD OPERATIONS AND HAND POSITIONS. A sudden slip could cause a hand to move into the cutterhead.

m. NEVER PERFORM LAYOUT, ASSEMBLY, OR SET-UP WORK on the table/work area when the machine is running. A sudden slip could cause a hand to move into the cutterhead. Severe injury can result.

5.2. Setup & Use – Jointer

Removing excessive amounts in a single pass is unnecessarily hard on the equipment and is a hazard to the operator and anyone else in the area due to possible jamming, stalling and throwing of the wood.


In-feed Table
Out-feed Table
Depth of Cut Scale (not shown in picture)
User CANNOT adjust this wheel
Depth of Cut Adjustment Wheel (1/16th" max. depth)
STOP Button
EMERGENCY STOP Button
START Button

The jointer setup involves four components as follows:

1) In order to use the jointer, the outfeed or rear table must be perfectly aligned with the knives in the cutterhead.

   - **<u>This is performed by an experienced member of the maintenance team ONLY and the left wheel which controls this setup CANNOT BE ADJUSTED by the general user.</u>**

2) **<u>Be sure to check</u>** how deep the cut will be:

   - The vertical distance between the infeed and outfeed table determines how much you will cut (or joint) off your wood.
   - With the power OFF, lay a straightedge across both tables. The distance below the outfeed/rear table to the infeed/front table defines the depth of cut.
   - Ideally, the jointer should be setup for a nominal cut of about 1/64" to 1/32" (.015").
     NOTE: The maximum depth of cut one can make is 1/16". The infeed table stop has been set by the maintenance team to prevent damage to the cutter head.
   - To adjust the depth of cut, the infeed table is raised or lowered by the rightmost wheel:
     - Loosen the infeed table position fix lever before turning the adjustment wheel and tighten once the table is adjusted to the proper height.
     - There is a depth of cut scale on the right side of the machine which is marked in fractional inches. Note the starting position of the scale's pointer, turn the handle **COUNTER-CLOCKWISE to LOWER** the table by the desired amount and thereby increase the amount of material the cutters remove. Or, **CLOCKWISE to RAISE** the table.
     - If you change this setting, please put it back to 1/16" when you are finished.

3) To check for fence squareness, use an accurate square between the table and the fence.

   - If it is square, you are ready to make a cut.
   - If it is found to be out of square:
     - Look behind the fence and pick up the threaded ball handle and screw it into the top of the fence.
     - Loosen the fence lock lever and with one hand holding the square and the other on the ball handle, ajust the tilt of the fence until it is square.
     - Carefully tighten the fence lock while holding the square in place to verify the tilt does not move upon re-tightening.

4) Making the Cut:

   - **Holding the Board Securely:** THE MOST DANGEROUS procedure for any operator is pushing boards through the jointer without the use of the pusher blocks . . . no hands should be in

direct contact with the flat side of the stock as it is passed through the unit. It is WRONG for operators to use the pusher block on the back of the stock with their right hand while pushing down on the front portion of the stock with their left hand. **It cannot be stressed enough that operators must use one of the yellow hold down blocks in the FRONT with the left hand AND a pusher block in the BACK of the stock. If the stock should happen to slip for any reason, it would be better to see flying bits of yellow plastic rather than bits of fingers and blood!**

- **Hand Pressure and Placement:** Your hands should be over the infeed table to get the piece started and to guide the piece until there is enough wood flat on the outfeed table. Then apply pressure on the outfeed surface to keep the machined edge of the wood flat, which forces the rest of the board to follow on the flat cut line.

Never have your hand directly on top of the workpiece when the cutter head is beneath your hand. Use push tools instead of your hand.

Always use a push stick when jointing an edge if the stock width is shorter than the height of the fence. (Notice that left hand is PAST the cutters)

- **Minimizing Chipping or Tearout:** To get the best surface possible from the jointer, its knives have to cut down or with the grain on the final finishing passes.

  On some pieces however, particularly when jointing the wide face, reading grain can be very difficult. Occasionally, taking very light cuts (1/32" max) in both directions and inspecting the surface between will reveal which produces the smoothest cut. For more information on reading grain direction, see *Section 4.1 Reading Grain Orientation*.

- **Defective Boards:**
  - If the defect is big, it may be better to reduce its severity with a preliminary cut using a saw. For more on this technique, see Section 5.4 Preparing Wood for the Jointer. This additional step can save time, wood and help reduce tapering of the board.
  - If the wood has a defect such as an arch or bow, apply enough pressure before and after the cutter head to keep the board as level to the table as possible during the initial cuts. Then, as soon as the jointer begins making a flat surface on the leading edge, pressure

should be concentrated over the outfeed table. That way the knives can extend that machined-flat portion and minimize the amount of wood that is removed during however many cuts needed to eliminate the rest of the defect.

- Another technique that can help true a slightly distorted board is swapping ends between the first few cuts. While the finish cuts should be made with the knives working 'down' or with the grain, reversing the piece during the initial cuts will help average wood loss at either end, help bring the board down flat to the tables evenly and actually minimize the amount of wood removed.

- **Feed Rate:** Feeding your workpiece too fast can cause a rippled appearance of the edge after cutting.
  - Slowing the feed rate slightly will allow the knives to clear the surface evenly and leave a flat, smooth edge.
  - When jointing a wide face, the feed rate has to be much slower even than when jointing an edge because there is so much wood being removed.
  - Also, as the wood gets harder, the feed rate has to be reduced.

6. PLANER, SURFACE/THICKNESS (24" KUFO Seco SK-824WP-VS, 16" LaGuna Platinum Series 16")

AFTER one face of a board has been flattened using the jointer, a planer is used to get the two faces of the board parallel to each other. Then, if needed, use the planer to reduce the thickness of that board.

6.1. Safety Precautions

a. ***NEVER ALLOW ANY PART OF YOUR BODY TO PASS BEYOND THE FRONT EDGE OF THE TABLE BED WHEN THE MACHINE IS IN OPERATION.*** STAND TO ONE SIDE of the machine when the unit is in operation to avoid being struck by objects thrown back.

b. WORKPIECE MUST BE 12" or longer.

c. DO NOT PLANE very thin workpieces that cannot be safely controlled. Loss of control of the workpiece can result in injury. **If a workpiece is thinner than 1/2", you must use a backer board.** Wood thinned to less than 3/8" can splinter and be sucked into equipment.

d. INSPECT WOOD for loose knots or embedded foreign objects (nails, staples, etc.) to prevent kick-back or damage to the equipment. Remove items or discard board. ***(IF you damage the knives because of nails, staple, rocks etc.., you'll have to pay for their repair)***

e. NEVER set the depth of cut to more than 1/16".

f. NEVER HAVE FINGERS under a board.

g. DO NOT FEED A WORKPIECE into the outfeed end of the machine.

h. REMOVE SHAVINGS ONLY with the power "OFF" to prevent serious injury.

i. PROPERLY SUPPORT LONG OR WIDE WORKPIECES. Loss of control of the workpiece can cause serious injury. Use roller supports or ask for help.

j. NEVER PERFORM LAYOUT, ASSEMBLY or set-up work on the table/work area when the machine is running. Serious injury can result.

k. NEVER LEAVE WHILE THE MACHINE IS STILL RUNNING. Turn the unit off and leave only after it has completely shut down.

6.2. Setup & Use – 24" KUFO Seco Planer

Surface plane the workpiece on a jointer until it is flat on one side. This will ensure that it sits flat on the planer table during operation.

To obtain even, uniform thickness across the length of a board, the stock being planed must have one face that has already been machined perfectly flat on the jointer and the stock must be fed with this flat face against the table.

6.2.1. Adjusting the Depth of Cut

a. Cut capacity:
   - WORKPIECE MUST BE 12" or longer
   - Max. Width = 23-1/2"
   - Min. Width = 2"
   - Max. Thickness = 6"

b. To set the initial depth of cut:
   - Use the spacer block provided and set it on top of your board and raise/lower the table until you can just get the spacer block out easily.
   - A depth of cut gage is located on the face of the machine to the right of and below the table. You can also measure the board thickness accurately (in the thickest area if it varies). Then subtract 1/16" and set the depth gage to this number.

c. **Be sure to always lock the depth adjustment after changing it.** The planer vibrates significantly and the setting can change during a cut.

d. Often it is desirable to get the lightest cut possible on a given workpiece.
   - To do so, set the depth setting so it is at least 1/8" more than the board at its thickest point.
   - Then, run a board and as you start it into the machine, lower the cut depth adjustment until the board moves steadily and a light cut is heard. Now you know you are taking a very minimum cut.
   - Run the board a second time to take this cut on the entire board and you have it.

e. To take subsequent cuts, rotate the depth of cut wheel one turn for each 0.050" cut you want. Generally, a full rotation is a good cut, more on softwoods.

f. The final cut on tight tolerance work should be about 0.030" or 2/3 of a turn. **Be sure to always lock the depth adjustment after changing it.** (Use one of the belt sanders to reduce the board to the final desired thickness.)

NOTE: *Anytime you switch directions with the handwheel, there will be a small amount of backlash. Always approach the final setting from the same (clockwise) direction for best accuracy.*

g. To get an accurate cut on a wide board, do a test cut and measure the four corners of the board. If there is a significant variation, maintenance should be done on the machine to level the feed tables with the cutterhead.

6.2.2. Operating the Planer

a. Start the planer by pushing the START button.

b. Place the flat side of the board down on the table and feed the workpiece through the planer.

- Feed workpiece into the planer with the grain to get a cleaner cut. *(see Section 4.1 Reading Grain Orientation)*. Tearout happens when you feed a board into the planer with the wrong end forward. The knives catch in the rising wood fibers and tear rather than cut them.

- Snipe is a term used to describe the planer gouge that often occurs at the beginning and end of boards as they enter and leave the planer. To help minimize snipe:
  - Be sure to lock the depth adjustment.
  - Leave an extra 5" of length on the board which can be cut off when you cut the boards to their final length.
  - Another approach is to feed in a sacrificial board first, then feed the workpiece board in against the end of the first board and lastly feed in another sacrificial board. The planer will treat it as one long board and only snipe the first and last boards.

- Lightly support the work going into the machine and when the workpiece passes by the end of the table on the out feed side. When feeding long boards, position a rolling table or roller support to support the board as it exits the planer, or ask someone to assist.

- When feeding multiple pieces or cuts, place the workpieces at different locations on the infeed table to cause the planer knives to wear evenly.

- If you take off too much material there will be a horrible noise and you will bog down the planer.

  CAUTION: If the cut is too heavy and bogs down the planer, turn the planer OFF immediately, allow it to come to a complete stop, lower the table and remove the workpiece. Adjust the depth of cut to remove less material and repeat the above steps.

c. Use one of the wide belt sanders to accurately reduce the board to the final desired thickness. *(However, do not use a wide belt sander as a thickness planer.)*

6.3. Setup & Use – 16" LaGuna Planer

Surface plane the workpiece on a jointer until it is flat on one side. This will ensure that it sits flat on the planer table during operation.

To obtain even, uniform thickness across the length of a board, the stock being planed must have one face that has already been machined perfectly flat on the jointer and the stock must be fed with this flat face against the table.

6.3.1. Adjusting the Depth of Cut

a. Cut capacity:
   - WORKPIECE MUST BE 12" or longer
   - Max. Width = 15-1/2"
   - Min. Width = 2"
   - Max. Thickness = 8"

b. To set the initial depth of cut:
   - Raise the table until wood stock slightly touches the red bar at the center located above the in-feed table.
   - **CAUTION: Maximum cutting depth is 1/16th"**

c. **Be sure to always lock the depth adjustment after changing it.** The planer vibrates significantly and the setting can change during a cut.

d. Often it is desirable to get the lightest cut possible on a given workpiece.
   - To do so, set the depth setting so it is at least 1/8" more than the board at its thickest point.
   - Then, run a board and as you start it into the machine, lower the cut depth adjustment until the board moves steadily and a light cut is heard. Now you know you are taking a very minimum cut.
   - Run the board a second time to take this cut on the entire board and you have it.

e. To take subsequent cuts, **a 1/4 wheel revolution** is a good cut.

f. To get an accurate cut on a wide board, do a test cut and measure the four corners of the board. If there is a significant variation, maintenance should be done on the machine to level the feed tables with the cutterhead.

6.3.2. Operating the Planer

a. To START/STOP the planer:
   - Open the Dust Collection Vent.

- Place the push/pull Geerbox knob/handle to NEUTRAL (Middle) position.

  CAUTION: Geerbox must be in NEUTRAL prior to engaging power.

- Open the RED RESET/STOP button by slightly twisting to right.
- Depress the GREEN START button to engage power
- Place the push/pull Geerbox knob/handle IN or OUT to engage the in-feed and out-feed power
  - IN for 16 FPM (Hardwood)
  - OUT for 20 FPM (Softwood).

b. Place the flat side of the board down on the table and feed the workpiece through the planer.

- Feed workpiece into the planer <u>with the grain</u> to get a cleaner cut. *(see Section 4.1 Reading Grain Orientation)*. Tearout happens when you feed a board into the planer with the wrong end forward. The knives catch in the rising wood fibers and tear rather than cut them.

- Snipe is a term used to describe the planer gouge that often occurs at the beginning and end of boards as they enter and leave the planer. To help minimize snipe:
  - Be sure to lock the depth adjustment.
  - Leave an extra 5" of length on the board which can be cut off when you cut the boards to their final length.
  - Another approach is to feed in a sacrificial board first, then feed the workpiece board in against the end of the first board and lastly feed in another sacrificial board. The planer will treat it as one long board and only snipe the first and last boards.

- Lightly support the work going into the machine and when the workpiece passes by the end of the table on the out feed side. When feeding long boards, position a rolling table or roller support to support the board as it exits the planer, or ask someone to assist.

- When feeding multiple pieces or cuts, place the workpieces at different locations on the infeed table to cause the planer knives to wear evenly.

- If you take off too much material there will be a horrible noise and you will bog down the planer.

  CAUTION: If the cut is too heavy and bogs down the planer, turn the planer OFF immediately, allow it to come to a complete stop, lower the table and remove the workpiece. Adjust the depth of cut to remove less material and repeat the above steps.

c. Use one of the wide belt sanders to accurately reduce the board to the final desired thickness. *(However, do not use a wide belt sander as a thickness planer.)*

7. SAW, TABLE (10" Powermatic 66-TA, Delta 36-L53L, Delta 34-806)

(NOTE: Portions of the information presented in this section were taken from the Powermatic & Delta Operating Manuals.)

The Table Saw is the most versatile machine in the Woodshop and is used to rip, square, miter and groove wood pieces. Before making any cut, **stop and think the task through.** The versatility of the table saw usually provides alternative ways of performing nearly any cut. So, if you encounter a situation that seems risky, consider using a different method or ASK advice from someone in the Woodshop.

The Woodshop currently owns three table saws. All three saws are equipped with a quality fence that has a fairly accurate tape measure built in – usually accurate to within 1/32". It is best to double check the accuracy of the tape when extreme accuracy is required for your project.

While all table saws can be used for many functions, the preference in our shop is the following:

- ***The 10" Powermatic 66-TA table saw is to be used primarily for CROSS CUTS.*** This saw has a very long miter and that miter is attached to a sliding table. This makes for crosscuts that are safer and more accurate than crosscuts using the miter on the other table saws.
- ***Our other large table saws (two 10" Delta table saws) are to be used primarily for RIP CUTS, for DADO CUTS and for other JIGS*** that may require removal of the blade guard.

7.1. Safety Precautions

a. **WARNING:** Always turn power off and wait until saw blade comes to a complete stop before adjusting or changing set-ups. If changing blades, also switch electrical control box to OFF position.

b. INSPECT WOOD for loose knots, embedded rocks or other items. Remove items or discard board.

c. BLADE GUARDS:

- Guards **must be in place and used whenever feasible**.

- For some tasks the guard may require removal. If removed, you must replace the guard before leaving the saw.

d. WITH POWER OFF, check the blade for sharpness and secure fastening to the arbor before machine is turned on. Blade should be free of rust and pitch.

e. ADJUST BLADE to be no more than 1/8" above the surface of the wood being cut.

f. MAKE SURE that fence or slide will not pass through the saw blade.

g. DO NOT CUT badly warped material.

h. KEEP HANDS OUT of the path of saw blade.

i. DO NOT perform any operation "freehand".

j. NEVER REACH around the blade while it is running.

k. STAND TO ONE SIDE of, not in line with, the saw blade cut when ripping and cross cutting.

l. ALWAYS USE a "push stick" when ripping narrow strips of 3" or less.

m. BE SURE to keep workpiece against the slider or fence.

n. NEVER USE just the fence as a cut-off gage when cross-cutting.

o. USE THE CORRECT SAWBLADE FOR THE INTENDED OPERATION. The blade must rotate toward the front of the saw. Always tighten the blade arbor nut securely – but do not over tighten. Before use, inspect the blade for cracks or missing teeth. Do not use a damaged blade.

p. NEVER ATTEMPT TO FREE A STALLED SAW BLADE WITHOUT FIRST TURNING THE MACHINE OFF. If a workpiece or cut-off piece becomes trapped inside the guard, turn saw off and wait for blade to stop before lifting the guard and removing the piece.

q. NEVER START THE MACHINE with the workpiece against the blade.

r. AVOID AWKWARD OPERATIONS AND HAND POSITIONS where a sudden slip could cause a hand to move into the blade.

s. NEVER PERFORM LAYOUT, assembly or set-up work on the table/work area when the machine is running.

t. CUTTING COMPLETELY THROUGH THE WORKPIECE IS KNOWN AS "THROUGH-SAWING". Ripping and crosscutting are through-sawing operations.

- Cutting with the grain is ripping. Use a fence or fence system for ripping. NEVER use a miter gauge for ripping. Use push sticks for ripping a narrow workpiece.

- Cutting across the grain is crosscutting. Never use a fence or fence system for cross-cutting. Instead, use a miter gauge.

u. BEFORE YOU LEAVE:

- Shut off power, lower blade below table, and clean the saw before you leave it.
- Verify all guards are in place, or reinstall guards.

7.2. Avoiding Kickback! – Table Saw (READ THIS SECTION!)

Kickbacks happen when the saw blade catches the workpiece and violently throws it back toward the operator causing serious injury to the operator or someone nearby. A kickback can be fatal. NEVER stand beside or walk behind anyone using a table saw.

7.2.1. Table Saw Guard

The Woodshop's rule is to use the blade guard whenever possible. The blade guard incorporates a spreader called a riving knife, which helps prevent the cut from closing on the back of the saw blade. It also has an integrated anti-kickback device that allows only forward travel past the blade.

7.2.2. Don't Be Afraid to Ask

Always ask for help from the Shop Monitor or another woodworker if you need assistance or if you are unsure of what you are doing.

7.2.3. Kickback when RIPPING or CROSSCUTTING

a) Internal stress in wood can cause the cut to close, pinching the saw blade. Use the blade guard whenever possible.

b) Always maintain control. Do not execute a cut where you do not have complete control of the situation.

- **Do not allow the wood to rise up or move sideways during a cut.** Hold the board firmly against the fence and down flat on the table until the workpiece is past the blade. You can also use feather boards very close to the start of the blade and feather board hold downs after the blade to control the wood all the way through the cut.
- **Do not release a workpiece until it is past the blade!**
- **NEVER lift your hand to reposition it during a cut!** Make sure you can reach all the way through the end of the cut without repositioning your hands.
- Make sure there are no obstructions.
- Do not cut a workpiece that is too large to handle. Ask for help with this cut.
- Never freehand-cut a workpiece. Free-handing causes crooked cuts and potential kickback. Always use the rip fence to guide the workpiece in a straight line when ripping.

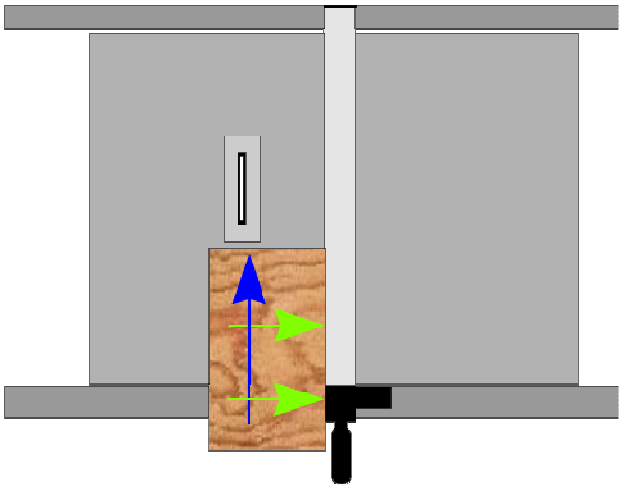
c) **Kickback can occur when the board is pinched between the rear of the blade and the rip fence.** The fence should be parallel with the blade. Never allow the fence to be closer to the rear of the blade than the front.

d) **Cutting a warped or twisted board along the rip fence is dangerous because it can get pinched between the fence and blade.** Prepare your board using the Jointer so you have a stable flat surface and one square edge before going to the Table Saw.

e) **Do not cut wet, pitchy, knotty or warped wood.** These flaws are much more likely to create pinching and therefore kickback.

f) **Do not use the rip fence as a guide during crosscuts.** It is easy for the workpiece to twist out of perpendicular at the end of the cut and thus get caught by the blade and thrown.

- To cut exact or repeated lengths using the rip fence, clamp a short block of wood to the fence close to the front rail the required distance from the blade so that the wood moves off the stop block before contacting the blade.
- Butt your stock to the stop-block to set the correct length, then as you move the miter fence towards the blade to make the cut, the wood will clear the stop-block and be guided only by the miter fence.

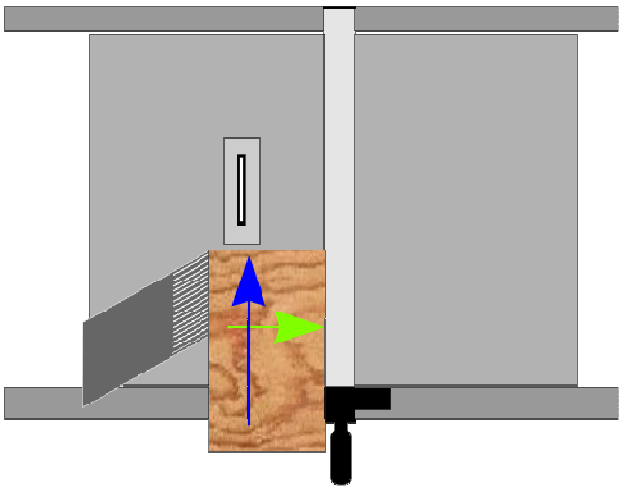


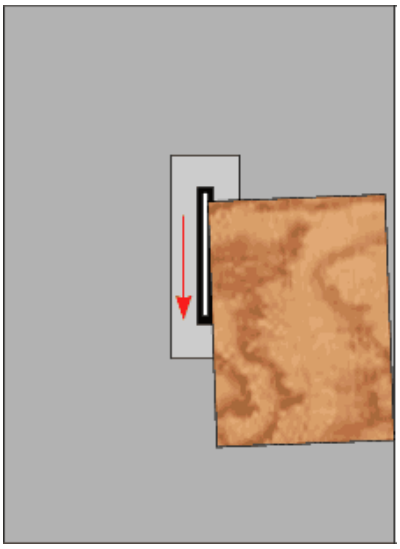
RIP CUT: When feeding stock, ensure that it is held <u>firmly against the fence</u> by pressure in the direction of the fence (the green arrows) AND firmly held down flat on the table.

Once a good contact has been established with the fence, feeding can begin (blue arrow).

RIP CUT: A featherboard can greatly assist in keeping stock tight against the fence, but can only be used horizontally in front of the blade.

Featherboards can also be used by clamping them vertically to the fence, where they will provide a downward force on the stock.





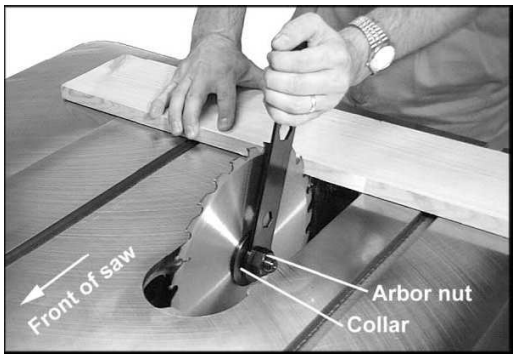
RIP CUT: If you allow the stock to twist or skew, as soon as it reaches the back edge of the blade, the up-running teeth will launch it at you, in the direction of the blade rotation (red arrow).

(Kickback diagrams courtesy of: http://www.raygirling.com/kickback.htm)

7.3. Setup – Table Saw

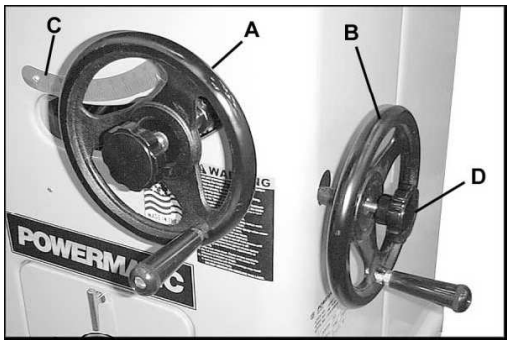
The setup and operation for all three table saws are essentially the same.

7.3.1. Changing the Blade



- Disconnect machine from power source.
- Remove table insert and raise the saw blade to its maximum height, then remove arbor nut and collar.
- Install blade, making sure the cutting teeth at the top of the blade point toward the front of the saw.
- Slide the collar on to the arbor and start the arbor nut on the threads. *(NOTE: Righthand threads; turn clockwise to tighten.)* Snug the arbor nut against the collar and blade with the provided arbor wrench, while holding blade with thumb and finger tips.
- Wedge a block of wood between the blade and table to prevent blade rotation, then tighten the arbor nut securely with the arbor wrench.
- Replace the table insert.

7.3.2. Blade Raising and Tilting

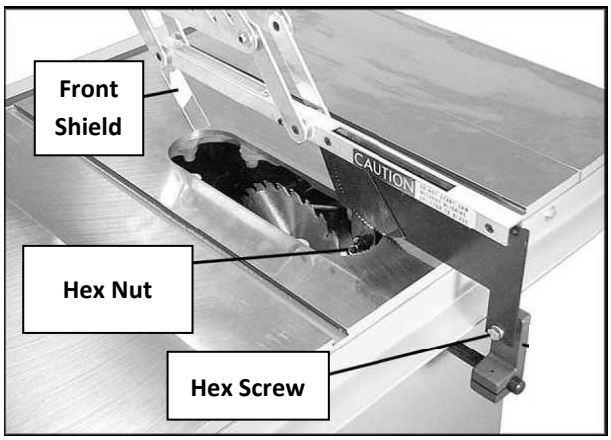


- The front handwheel (A) controls the raising and lowering of the blade.
- The side handwheel (B) controls blade tilt, which is indicated by the scale (C). The blade tilting mechanism allows the blade to be tilted up to 45° to

the LEFT for the Powermatic and 45° to the RIGHT for the Delta.

- The lock knobs (D) are used to lock the setting of the handwheels. (***NOTE:*** *Only a small amount of force is required to lock the mechanism securely. Any added force merely puts unnecessary strain on the locking device.)*

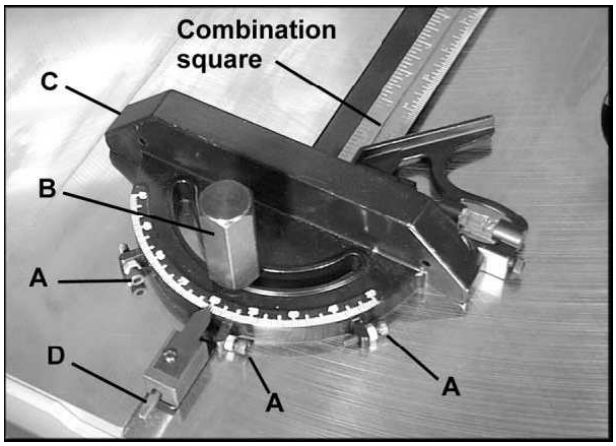
7.3.3. Installing Splitter Guard Assembly



- Place the two flanges of the splitter assembly onto the screws as shown.
- Snug the screws.

NOTE: *Make sure the front shield faces in toward the blade.*

7.3.4. Miter Gauge Adjustment



- Slide the miter gauge into one of the slots on the table top.
- The miter gauge is equipped with index stops at 90 degrees and 45 degrees right and left.
- To operate the miter gauge, loosen lock handle (B) and move the body of the miter gauge (C) to the desired angle. The miter gauge body is set to stop at 0 degrees and 45 degrees left or right. To move the miter gauge beyond these points, the stop rod (D), must be pulled out.
- If accurate crosscutting work is to be done using the miter gauge, check its squareness to the slot with a square as shown. Re-adjust the stop position as required.

7.3.5. Conditions Which Can Cause Kickbacks (See also 7.2)

Serious injury can result from kickbacks which occur when a work piece binds on the saw blade or binds between the saw blade and rip fence or other fixed object. This binding can cause the work piece to lift up and be thrown toward the operator. Listed below are the conditions which can cause kickbacks:

- **Releasing the workpiece before completing the operation or not pushing the workpiece all the way past the saw blade.**
- Confining the cutoff piece when crosscutting or ripping.

- Not using the splitter when ripping or not maintaining alignment of the splitter with the saw blade. *(**WARNING:** The splitter is removed when you remove the blade guard!)*
- Using a dull saw blade.
- Not maintaining alignment of the rip fence so that it tends to angle toward instead of away from the saw blade front to back.
- Applying feed force when ripping to the cutoff (free) section of the work piece instead of the section between the saw blade and fence.
- Ripping wood that is twisted (not flat), or does not have a straight edge, or has a twisted grain.

7.4. Safety Devices

The only reasons for your fingers to be near the blade are poor technique and even worse judgment.

Blade Guard: Some procedures, such as cutting dados or using jigs, require removal of the guard and splitter assembly. However, the vast majority of table saw procedures are easily accomplished with far greater safety if the blade guard and splitter remain installed.

- The splitter prevents the kerf from closing and binding the blade, causing kickback. This is especially problematic when wood is cut along the grain (rip cut).
- The anti-kickback pawls prevent the workpiece and cut-off piece from being thrown back at the operator.
- The plastic guard prevents dust and debris from being thrown at the operator.

Push Pads & Push Sticks: These items help feed the workpiece along fence and blade while keeping the operator's hands at a safe distance from the blade. The intent of push devices is that when things go wrong, the push device contacts the blade rather than your fingers or hand. They:

1) Space your hand farther from the blade

2) Put sacrificial material between your hand and the blade

- **<u>Push pads</u>**. Push pads are the preferred pusher, as they give some directional control over the wood – important at least until wood reaches the splitter. A step near the rear of an extended "foot" gives the operator very good directional control while pushing the piece across the blade. Even with the splitter in place, this additional control allows keeping the wood firmly

against the fence throughout the cut. That is safer and produces a much smoother, more accurate, cut edge at the same time.

- **Push stick**. The Woodshop has three types of additional pushers in the shop, as pictured below. You hook the notch over the wood and push it through, hoping it doesn't turn into the blade before enough of it reaches the splitter. The problem with the design of this type of pusher is that it affords virtually no directional control over the wood. They are sometimes necessary when cutting narrower strips, but the best approach is to rip the narrow piece from the larger piece whenever possible.

- **Magnetic Featherboard:** Use a push stick in conjunction with a magnetic featherboard, it keeps you hands safe and the board firmly against the fence for directional control.

7.5. Feed Rate

The speed at which the wood is pushed into the blade (feed rate) is important to the quality of the cut and safety.

Too Fast…

Moving the wood across the blade too quickly can result in:

- Excessive chipping or splintering along the cut edge
- Workpiece may feel like it wants to ride up on the blade
- Saw bogs down
- Feeling like you have to apply more pressure than normal

Too Slow…

- Moving the wood too slowly is usually evidenced by burning of the wood along the cut edge.
- The species of wood can make a difference as some, like maple, burn more quickly than others.

Just Right…

When you are moving the wood across a good blade at the proper rate, the cut edge will show minimal chipping, splintering or burning. Also, you will feel the blade cutting, but you are not pushing with a lot of force, leaning into it or fighting to hold the board – let the tool do the work.

7.6. Rip Cuts

Ripping is where the workpiece is fed with the grain into the saw blade using the fence as a guide and a positioning device to ensure the desired width of cut.

While all table saws are capable of rip cuts, our preference is that the Delta saws be the primary ones used for rip cuts.

Keys to safe, accurate rip cuts include:

1) Have a sufficiently long straight edge against the fence. The side of the wood against the fence **must be straight** or the wood can rock while engaged with the blade, creating potential for kickback. If the wood to be cut does not have at least one straight edge, it should be jointed to create one.

2) Use a good push handle or push pad to guide the wood through the blade.

The size of the piece being cut is also important:

- Small pieces of wood are exceptionally difficult to control while being pushed across the table saw blade. **When confronted with a piece of wood less than 12" long, use another machine**, like a band saw to make the cut.
- Ripping narrow pieces can be dangerous. If possible, rip the narrow piece from the larger piece. Use one or more push pads or push sticks to avoid placing your hands between the fence and the blade. Always use care to avoid binding narrow strips between the anti-kickback pawls and the splitter.
- Another common problem area is trying to control a long piece of wood. The Woodshop has large outfeed tables on our table saws, so this only applies to really long pieces. When the length of the wood dictates, ask the Shop Monitor or another woodworker to assist – this lets you concentrate on making the cut, not on catching the wood on the other side of the blade.

Making the cut:

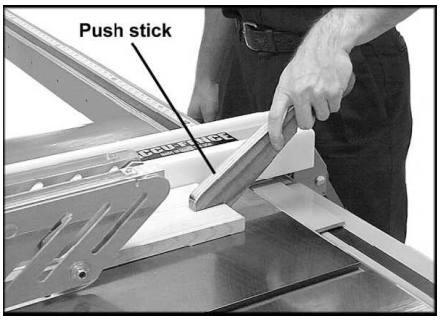
a) The rip fence should be set for the width of the cut by using the scale on the front rail, or by measuring the distance between the blade and fence. Stand out of line with the saw blade and workpiece to avoid sawdust and splinters coming off the blade or a kickback, if one should occur.

b) If the wood to be cut does not have at least one straight edge, joint it first to create one.

c) Before starting the cut, raise the blade so that it is about 1/8" higher than the top of the workpiece.

d) When ripping, feed force should always be applied between the saw blade and the fence.

- In ripping, use LEFT hand to hold the board down against the fence or fixture, and the RIGHT to push it into the blade between the blade and the fence. Never push in a location such that the RIGHT/pushing hand is in line with the blade.
- Only use the LEFT hand to guide the workpiece against the fence, and remove it from the work about 12" in front of the blade. Continue to feed material with RIGHT hand, keeping to the right of the path of the blade.
- After the cut is complete, use a push stick to feed cut-off piece past the blade.



e) When the workpiece is past the blade, the work will either stay on the table or tilt up slightly and be caught by the end of the guard. Alternately, the feed will continue to the end of the table, and be lifted and brought along the outside edge of the fence.

f) When ripping boards longer than the table, use a work support at the rear of the saw to keep the workpiece from falling off the saw table or ask someone in the shop to assist you.

7.7. Crosscuts & Miter Cuts

The Powermatic saw is equipped with a long miter attached to a sliding portion of the table. Crosscuts made on this saw are safer and much more accurate than if made with the smaller miter gauge on the Delta saws.

Crosscutting is where the workpiece is fed cross-grain into the saw blade using the miter gauge to support and position the workpiece.

Keys to making a high-quality crosscut and miter cut include:

- A properly-adjusted miter gauge
- Cutting on the layout marks
- Maintaining control of the wood and avoiding kick-back:
    - Make sure your workpiece does not rock against the miter gauge face or slip sideways during the cut.

- **NEVER lift your hand up during a cut!**

- Another tip for making accurate miter cuts, particularly steep ones, is to make an initial cut about 1/16" over the length needed. Then carefully make a final cut on the layout line. The initial cut removes most of the waste, leaving less than the blade's width to trim away. This greatly reduces the force of the blade on the wood and makes holding the wood absolutely still during the cut easier.

Never let the wood to be in contact with the miter gauge fence and the rip fence at the same time during a cut. If the teeth of a blade (or stacked dado) are engaged with the wood, then that wood can kick out if it cocks at all during the cut.

- For repetitive crosscuts, the Woodshop has a special fixture which attaches to the fence to use as a stop when repositioning the wood for the next cut.

- To avoid simultaneous contact of the wood with the rip fence and miter gauge, the gauge block must be set close to the operator's end of the fence. That way the wood can be slid over until it butts against the gauge block to size the cut. When the workpiece is moved forward towards the blade, **it must move off the gauge block before contacting the blade**. When the cut is complete, the waste can safely drop to the table without becoming trapped between the blade and fence.

7.7.1. Large Miter Gauge for the Powermatic Saw

This miter gauge is easily adjusted, therefore it is often out of adjustment.

ANGLE SETTING: You are advised to double check to see that the angle setting is at 90 degrees using a large carpenter square. In the case that it is not at 90 degrees, or extreme accuracy is necessary, you need to ask the Shop Monitor to either help you or put you in touch with someone else in the shop that can.

While the *Powermatic* saw is used primarily for cross cuts at a 90 degree angle, this miter also allows you to cut angles as large as 45 degrees on large pieces of wood. You are encouraged to use the miter saw whenever possible for angled cuts, and not adjust the miter on this saw. If you must cut other than 90 degree angles on this saw, seek help from the Shop Monitor. The Shop Monitor will either help you or find someone that can help with adjusting this miter.

ACCURACY OF THE TAPE: You are advised to double check the accuracy of the tape measure on top of the gauge. If it is not accurate, you need to tell the Shop Monitor and take into account the size of the error if you use it prior to it being readjusted by the Shop Monitor.

USE THE CAPABILITIES OF THE MITER: There is a stop on the miter – one you can use to get accurate repetitive cuts. There is also an extender on the end of the miter – to be used with long pieces that hang over the end.

7.7.2. Making a Crosscut or Miter Cut

Mitering is the same as crosscutting except that the miter gauge is locked at an angle other than 0°. Follow the procedure below for either type of cut.

CAUTION: *Miter angles greater than 45° may force the guard into the saw blade and damage the guard. Before starting the motor, test the operation by feeding the workpiece into the guard. If the guard contacts the blade, place the work piece under the guard, NOT TOUCHING THE BLADE, before starting the motor.*

a) Before starting the cut, raise the blade so that it is about 1/8" higher than the top of the workpiece.

b) Place the work against the miter gauge and advance both the gauge and work toward the saw blade.

- You can use the miter gauge in either table slot.
- Before starting a cut, be sure the miter gauge is securely clamped at the desired angle.

c) For 90 degree crosscutting, most operators prefer to use the left-hand miter gauge slot. When using it in this position, hold the workpiece against the miter gauge with the left hand and use the right hand to advance the workpiece.

d) Start the cut slowly and hold the work firmly against the miter gauge and the table. Keep both hands on the miter gauge and workpiece. Do not touch the cut-off piece.

e) Feed the workpiece steadily through the blade until the workpiece is completely cut. Shift the workpiece slightly sideways away from the blade, then pull the workpiece and miter gauge back to the starting position.

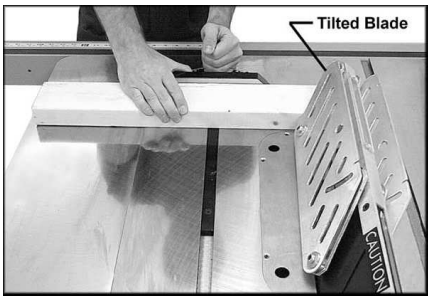
f) Remove the workpiece and then use a push stick to push the cut-off piece past the blade and off the table before beginning the next cut.

7.8. Bevel & Compound Angle Cuts

It is important to remember that because of the angle of the blade, it is cutting considerably more wood than when it is straight up. That increases the resistance of the blade cutting the wood proportionately. Maintaining a firm grip on the wood and slowing the feed rate slightly will help make a true, straight cut while decreasing the chances of the wood cocking and kicking back.

WARNING: *Use caution when starting the cut to prevent binding of the guard against the workpiece.*

7.8.1. Bevel crosscutting



Bevel crosscutting is the same as crosscutting except the bevel angle is set to an angle other than 0°.

Always use the miter slot which allows the blade to tilt away from the miter gauge and your hands to avoid a binding action between the saw blade and the table top.

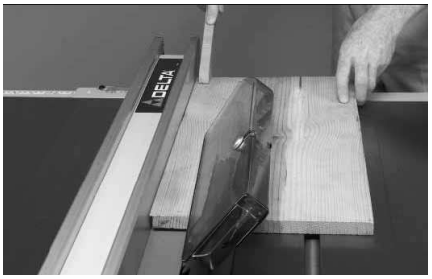
When beveling with the miter gauge, the workpiece must be held firmly to prevent creeping.

7.8.2. Compound Mitering

Compound mitering is a combination of bevel crosscutting and mitering, where the blade is beveled to an angle other than 0° and the miter gauge is locked at an angle other than 0°.

Always use the miter slot which allows the blade to tilt away from the miter gauge and your hands.

7.8.3. Bevel Ripping



Bevel ripping is the same as ripping except that the bevel angle is set to an angle other than 0°.

Always use the miter slot which allows the blade to tilt away from the miter gauge and your hands.

7.9. Dados & Rabbets

When the piece being cut is narrow enough to make it unstable at the table saw, using a router and jig is often a safer and more effective choice.

Dadoing is cutting a rabbet or wide groove into the workpiece.

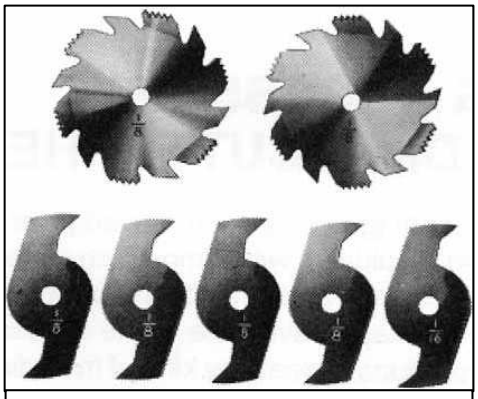


Figure 1. Dado Saws & Cutters

Most dado head sets are made up of two outside saws and four or five inside cutters (***Figure 1***). Various combinations of saws and cutters are used to cut grooves from 1/8" to 13/16" for use in shelving, making joints, tenoning, grooving, etc.

When cutting a dado or rabbet at or near the edge of the wood, a sacrificial face must be added to the fence to prevent the cutter from accidentally contacting the fence. The sacrificial fence also allows “burying” part of the dado stack to cut narrow rabbets. The sacrificial fence is usually just a length of 3/4”-thick wood with a semicircular cutout for blade clearance clamped to the permanent fence.

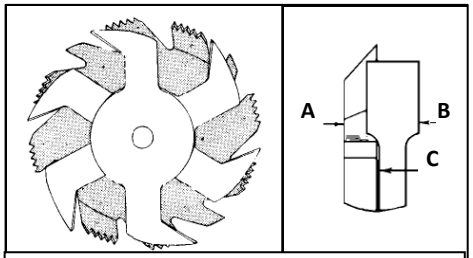
Another benefit of the sacrificial fence is that if made tall enough, a feather board can be clamped to it to help keep the wood being cut flat on the table to ensure a consistent depth dado. We do not currently have one in our Woodshop, but one can be made.

To make a dado or rabbet cut:

a) Remove blade guard and splitter assembly.

b) Stack the saws and cutters and install:

- The cutters are heavily swaged and must be arranged so that the teeth do not hit each other during rotation.
- The heavy portion of the cutters should fall in the gullets of the outside saws (***Figure 2***).
- The saw and cutter overlap is shown in **Figure 3** - (A) being the outside saw, (B) an inside cutter, and (C) a paper washer or washers, used as needed to control the exact width of groove.
- Position the teeth of the saws so that the raker on one saw is beside the cutting teeth on the other saw.

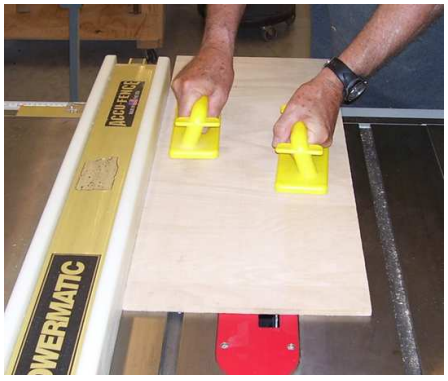


Figures 2 & 3

- Install the set, making sure the teeth point to the front of the saw, and securely fasten.
- Install the Dado Insert.

c) Perform test cuts on scrap pieces to be sure the dado width fits properly. Dado sets usually include a chart specifying combinations of blades and chippers to produce common width grooves. You will often have to shim that stack slightly to get a proper fit.

d) Use push pads, push sticks, hold-downs, jigs, fixtures, and/or featherboards to help guide and control the workpiece. In addition to the increased "grip" on the wood, these devices add distance and material between your hands, the wood and the cutter. Because of the inconsistency of wood thickness you cannot assume the cutter is buried in the wood and that it is safe to push the wood across it with bare hands.



e) Keep the wood flat on the table and maintain a feed rate that allows the cutter to work rather than force feeding the wood into it. Even at cutting depths of 1/4", the width of the dado cutter means that a considerable amount of wood is being removed. Overly fast feed rates can easily translate into chipping at the edges and an inconsistent depth of the cut.

8. SAW, BAND (15" General International 490, 14" LaGuna LT14-3000 Series, 20" Delta 28-640/641)

Band saws are capable of performing a wide range of cuts such as ripping, cross cutting, beveled cuts, curves and re-sawing (slicing thick boards into several thinner boards).

The Woodshop has the following bandsaws:

- One 15" General International 490 is setup with a 1/4" blade for fine turns and has a fence system.
- One 15" General International 490 is setup with a 3/8" blade and a fence system.
- One 14" LaGuna LT14-3000 Series is setup with a 1/2" blade and a LaGuna Drift Master Fence for re-sawing boards.
- One 20" Delta 28-640/641 setup with a 1" blade for re-sawing of boards and logs.

General

LaGuna

Delta

8.1. Safety Precautions

DO NOT BACK WORKPIECE OUT OF A CURVE CUT WHILE THE SAW IS RUNNING. STOP THE SAW, then backout the workpiece! Backing out of straight cuts is OK, but must be done carefully. Relief cuts are necessary when making curved cuts that are too tight for the blade.

---

a. **NEVER leave a saw running unattended. Turn OFF the power and make sure the blade has stopped completely before leaving the area.**

b. ADJUST UPPER BLADE GUIDE to about 1/8” to 1/2" above the material being cut. This gives you a better cut and puts less stress on the blade.

c. HOLD WORKPIECE firmly against table and feed into blade at a moderate speed.

d. DO NOT attempt to saw wood that does not have a flat surface unless a suitable support is used.

e. USE A SUITABLE SUPPORT fixture for large material.

f. TURN OFF SAW if wood needs backing out of an incomplete or jammed cut.

g. STOP MACHINE before removing scrap pieces from the table, or push off table with piece being cut or other wood – but definitely do not flick away with your fingers!

h. ALWAYS MAINTAIN a 3” margin of safety between the blade and the hand.

i. ALLOW SAW to reach full speed before beginning cut.

j. NEVER START THE MACHINE before clearing the table of all objects (tools, scrap pieces, etc.).

k. NEVER START THE MACHINE with the workpiece against the blade.

l. WHEN SAWING IS COMPLETE, turn machine OFF and apply brake if so equipped. Wait for machine to completely stop before removing pieces from the table.

m. AVOID AWKWARD OPERATIONS and hand positions where a sudden slip could cause a hand to move into the blade.

n. NEVER PERFORM LAYOUT, ASSEMBLY, or set-up work on the table/work area when the machine is running.

8.2. Setup & Use – 15” General International Band Saws

a. Machine Setup:

- One is setup with a 1/4" blade for fine turns and has a fence system.
- One is setup with a sturdier 3/8” blade and a fence system.

b. For all cuts:

- With the motor turned off, place the stock to be cut flat on the band saw's table and lower the blade guides to within 1/8" to 1/2" of the stock. This will increase the accuracy of your cut. But more importantly, leaving the blade guides too high places undue tension on the blade increasing the likelihood you'll break the blade.
- The band saw blade will leave cut marks that will need sanding and it is hard to follow the line exactly, so this leaves a slight bit of stock outside the line that can be cleaned up with a spindle sander afterwards.

- Start up the band saw and wait until the motor is at full speed before beginning any cut.
- Place one hand should be on each side of the stock to guide it through the blade. Never place your hand directly in the cut line, even if it is more than 3" away. Use a push stick if you must hold the stock closer than 3". Also, never reach across the band saw.
- Do not attempt to "free-hand" the stock in mid-air. The stock must remain flat on the surface of the table at all times during the cut.
- If a specific, consistent-width rip or specific angle is to be cut, use a band saw rip fence or miter gauge to increase the accuracy and safety of the cut. Even better, use the table saw.
- Always move wood slowly and methodically into the blade. Do not force the wood against the blade; apply only enough pressure to gently move the wood through the blade.
- If you must back out of your cut, hold the stock firmly in place with one hand and turn the motor off with the other. Once the blade has come to a complete stop, it is safe to back the stock out.
- If someone tries to interrupt you while making a cut, do not avert your eyes from the tool; finish the cut or turn off the saw before diverting your attention. Too often injuries occur because the operator was distracted, even for only a moment.

c. When cutting curves, draw the outline of your intended cut line on the stock.

- Then, keeping the wood flat against the table, carefully guide the stock through the saw along the outer edge of the cut line.
- When cutting curves, determine if relief cuts are necessary and make them first. These are cuts that cut through scrap portions of your workpiece to give you a better angle on accessing a section of your outline. Relief cuts keep you from twisting and potentially breaking the blade. You will also get more accurate cuts by cutting a tight curve in short sections.

d. When ripping wood:

- Use a rip fence and gently push the wood through.
- Keep the wood held firmly against the rip fence. Use the magnetic feather boards.
- Push at a 45 degree angle toward the forward direction so that the pressure is evenly distributed between the forward direction and the rip fence.
- When coming to the end of the rip, always keep your hands clear of the blade and use push blocks.

e. When using your band saw, there will often be very small pieces of stock that are cut off of your big piece of wood during the cutting process.

- **Do not attempt to flick these away from the blade with your fingers!** Use another piece of stock or a push stick. Often this is not necessary, as the next cut will push the piece safely away from the blade. Once the cut off piece is safely away from the blade, push it off of the table. Never leave loose pieces on your table that could impede your cut.

8.3. Setup & Use – 14" LaGuna Band Saw with Drift Master Fence

CAUTION: Clamp Locking Screws on this unit MUST NOT be over-tightened.

a. Machine Setup

- The LaGuna is setup with a 1/2" blade and a Drift Master Fence for re-sawing boards.
- The re-saw (throat) capacity is 14".
- The machine is supplied with a **foot brake**. It is located close to the ground on the right-hand side of the machine. It has two functions.
    - First, to remove the power to the motor.
    - The second function is to slow the lower flywheel, this is achieved by applying a brake pad to the flywheel. The more pressure that is applied, the faster the flywheel slows.

b. Changing Fence Height

- Aluminum fence can be adjusted to either a HIGH or a LOW position.
    - HIGH position is used to support tall stock.
    - LOW position is used to cut thin stock and allow the Upper Guide Assembly arem to be correctly lowered close to the stock material.
- To Adjust:
    - Loosen the 2 Fence Clamp Screws located on the back side of the Fence Mounting Bracket
    - Slide the Fence forward onto the table and remove from the mounting Bracket ***(CAUTION: Take care not to drop and damage the Fence)***
    - Reverse the Fence (HIGH to LOW, or LOW to HIGH)

c. Adjusting Fence Parallel with Blade

Using a properly aligned fence as a guide to perform straight rip and re-saw cuts will eliminate the tendency for saw cuts to drift or to cut at a slight angle.

- To Adjust:
    - Loosen the single **Fence Clamp Locking Screw** located on the underside of the **Fence Slide Block** supporting the **Fence Mounting Bracket**.

- Slide the fence and scrap stock forward and secure the single **Fence Clamp Locking Screw**.
- Turn band saw ON and make a 1 inch test cut in scrap stock. Do not remove stock.
- Depress Brake Pedal to turn power OFF and stop blade motion.
- Check variance of space on either side of back of blade. *Alignment is complete when back of blade is centered in test cut.*

- Re-align as necessary:
  - Loosen the two Clamp Screws located on the **top** of the **Fence Mounting Bracket**.
  - Use 'Star Wheel' located at base of **Fence Mounting Bracket** to adjust fence left or right until blade is centered in test cut.
  - Repeat the test cut to ensure you have achieved proper alignment.
  - Secure the two **Clamp Screws** (DO NOT over-tighten).

d. When ripping wood:
   - Use a rip fence and gently push the wood through.
   - Keep the wood held firmly against the rip fence. Use the magnetic feather boards.
   - Push at a 45 degree angle toward the forward direction so that the pressure is evenly distributed between the forward direction and the rip fence.
   - When coming to the end of the rip, always keep your hands clear of the blade and use push blocks.

e. Re-saw Procedures: The procedure for cutting/slicing thick or thin stock for making veneers or book-matching. Precise and repeated re-saw cuts can easily be made from a single piece of stock with proper set-up of the 'Drift Master Fence'.
   - Preparations:
     - Adjust fence (HIGH or LOW) to accommodate size of stock to be re-sawed.
     - Loosen the single Clamp Fence Lock Screw located on underside of Fence Slide Block supporting the Fence Mounting Bracket.
     - Place stock flat against fence and slide fence with stock forward until it *slightly* touches the band saw blade.
     - Push the flat **Screw Drive Lever** forward until it actively engages the **Screw Drive Assembly**. (Lever is located at bottom front of **Fence Slide Block**)
   - Adjusting for Desired Thickness of Re-saw:
     - Pull the stock back and clear of the blade.
     - All cuts will be made from the outboard side of stock opposite of the fence.

- As with any re-saw blade, the surface finish of the cut will not be completely smooth. *(NOTE: Adjust thickness to allow for finish sanding to final desired thickness)*
- The small **Hand Wheel** attached to and located at the back of the **Screw Drive Assembly** will provide the proper adjustment for thickness of cut.
  - **The single Clamp Fence Locking Screw must be:**
    - **Loosened prior to making any adjustment to the fence.**
    - **Tightened when the adjustment has been completed.**
    - ***CAUTION: Clamp Locking Screws on this unit must not be over-tightened!!***
  - Rotating the Hand Wheel counter-clockwise one full revolution will move the fence and stock forward 1/16". Two full revolutions will move the fence and stock forward 1/8'.
  - ***NOTE: Always rotate the disk one extra full rotation more than the desired re-saw thickness to account for the 1/16' kerf/cut of the blade.***

8.4. Setup & Use – 20" Delta Band Saw (for Re-sawing)

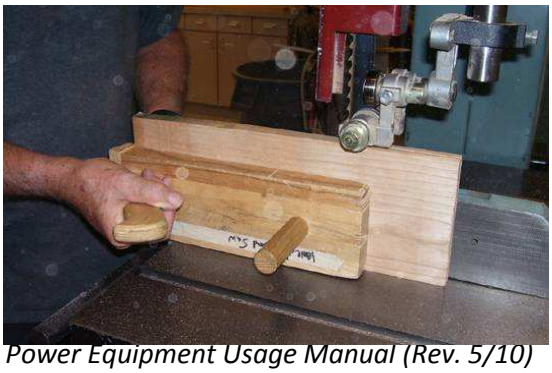
Start by positioning the fence and double checking to make sure it is square (at 90 degrees). This is especially necessary for this saw.

a. Machine Setup: The 20" Delta 28-640/641 setup with a 1" blade for re-sawing of boards and logs.

b. Primary Use is 're-sawing':

- Cut thick boards down to thinner boards
- Make veneer from precious figured board.
- If you want thin stock for small boxes or drawers, it's a lot cheaper to make your own than to buy it.
- Get useful lumber from a log.
- Cut blanks for turning on the wood lathe.

When re-sawing boards, be sure to use a PUSH BLOCK to keep your fingers well away from the action!



CAUTION: When cross-cutting logs, be sure that you <u>DO NOT use the fence</u> (just as when cross-cutting with the table saws), you can bind and break the blade!

c. <u>Re-sawing Boards</u>: Set the fence to the required thickness and use a push block.

d. <u>Sawing Logs</u>:

- Ideally, you'll have a sled to hold onto the log and prevent it from rolling while you cut and providing stability for these difficult cuts.
- As of the writing of this manual, the Woodshop does not have such a sled, but one can be made. **<u>Cutting logs without a sled is dangerous, as it is hard to hold the wood strait without twisting the band saw blade inadvertently. Twisting the blade has the potential result of breaking the blade, which will go flying – so be sure to wear your safety goggles!</u>**

9. SAW, MITER – DUAL BEVEL COMPOUND (12" DeWALT DW716) & DUAL BEVEL COMPOUND SLIDING (12" DeWALT DW718)

The ability to precisely angle and bevel the saw before cutting into the wood gives the compound miter saw its versatility. When you need to make a precise, compound angle cut on the end of a piece of stock, few tools are as easy to use.

9.1. Safety Precautions

a. **DO NOT perform any operation freehand.**

b. KEEP GUARD IN PLACE at all times.

c. AVOID CUTTING badly warped material.

d. DO NOT CUT any metals (Iron, steel, aluminum or copper) or masonry.

e. DO NOT OVERREACH or work in an awkward position. Keep footing and balance at all times.

f. DO NOT FORCE CUT. Allow motor to reach full speed before cutting.

g. SECURE WORK against the fence. Use clamps to hold work when practical.

h. HANDS and FINGERS must be kept a minimum of 3" from the blade. DO NOT attempt to cut small workpiece less than 3" long without clamping.

i. DO NOT MOVE either hand from saw or workpiece or raise saw arm until blade has stopped.

j. DO NOT TAKE your hand away from the trigger switch and handle until the blade is fully covered by the lower blade guard.

9.2. Setup & Use – Compound Miter Saw

9.2.1. Capacity & Angles

A compound miter saw can be angled either to the left or right and has a clearly marked miter gauge. The saw is also able to tilt and miter at the same time.

a. Bevel 0° - 48° with positive stops at 0°, 33.9°, 45° and 48° both left and right.

b. Cuts 2 x 10" dimensional lumber at 90° and 2 x 8" at 45°

c. 0-50° left and right miter capacity

9.2.2. Operation

The laser light will show exactly where the saw will cut. For precision cuts, it is important to perform a test cut to identify the exact relationship of the laser line to the finished cut. Once you know where the saw blade will cut, then you can accurately cut your workpiece.

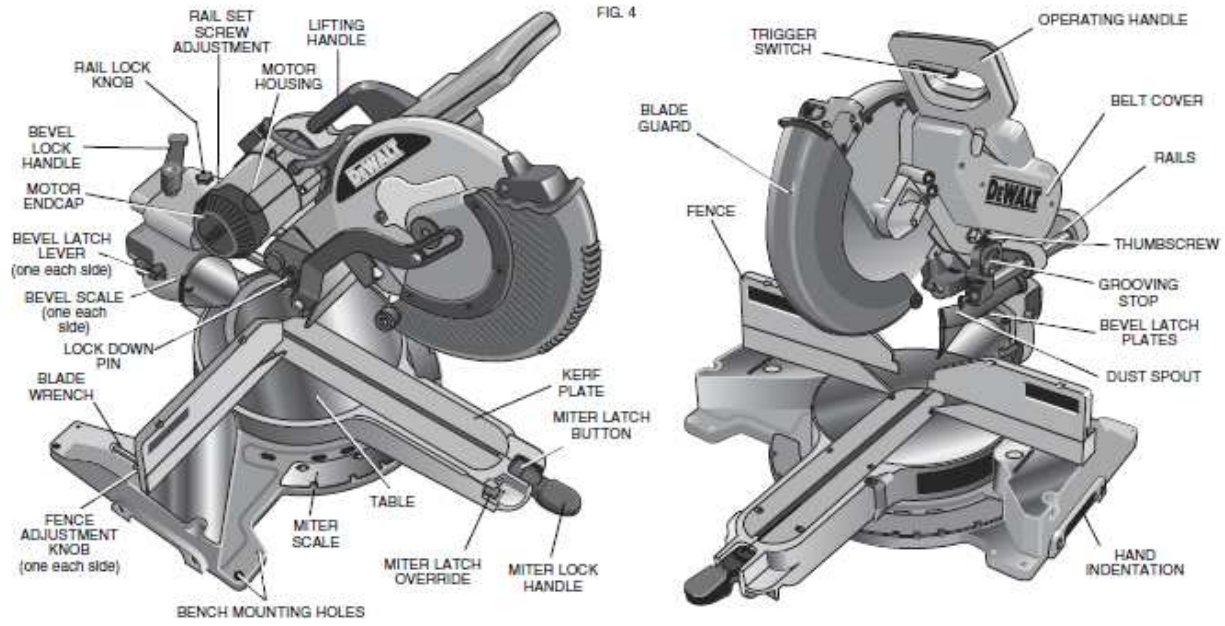
a) Mark the spot for the cut

b) Set the saw's miter and bevel angles

c) Secure the stock firmly against the fence

d) Line up the mark with the laser line and the saw blade will cut to the right of the laser line

9.3. Setup & Use – Sliding Compound Miter Saw



10.2.1. Capacity & Angles

The sliding compound miter saw is operated the same as the compound miter saw, but has the ability to accommodate larger boards:

a. Bevels 0° - 48° with positive stops at 0°, 22.5°, 33.9° and 45° in both directions.

b. Cuts up to 2x16" dimensional lumber at 90° and 2x12" at 45°.

c. Miters 60° to the left and 50° to the right.

9.3.1. Operation

For precision cuts, it is important to perform a test cut to identify the exact relationship of the marked line to the finished cut. Once you know where the saw blade will cut, then you can accurately cut your workpiece.

a. Mark the board for the cut.

b. **Setting miter and bevel angles**:

- Bevel angels can be set at 48 degrees right or left and can be cut with miter arm set between 50 degrees right or 60 degrees left.

- Loosen Bevel Latch Lock Handle.
- Unlock a Bevel Latch Lever (one on each side).
- Move saw left or right to desired angle of cut.
- Lock Bevel Latch Lever.

c. **Basics of making a cut**:

- Line up the cut mark with the blade.
- Depress trigger switch to turn ON:
    - Allow blade to reach full RPM before making cut.
    - Hold stock firmly against table and fence.
    - Do not force blade down – Lower saw head smoothly and slowly.
- Release the trigger switch to turn OFF.
    - Allow the blade to stop before raising saw head.

d. **Crosscuts** (Cutting stock across grain at any angle):

- Stock smaller than 2x8" – Tighten Rail Lock Knob to prevent saw from sliding forward on rails.
- Stock larger than 2x8" (or 2x6" if at 45 degree miter):
    - Loosen Rail Lock Knob.
    - Pull saw out toward you.
    - Lower saw head down toward workpiece.
    - Slowly push saw back to complete cut.

10. SAW, PANEL (64" Safety Speed Cut 6400)

(NOTE: Portions of the information presented in this section were taken from the Safety Speed Cut Operating Manual.)

10.1. Safety Precautions

a. NEVER leave the saw running unattended.

b. DO NOT overreach. Maintain control.

c. DO NOT force the tool into workpiece.

d. AVOID kickback by keeping blade from binding.

e. IF the saw is stopped in mid-cut, allow the blade to stop completely. Then back up the saw before restarting.

f. CROSSCUTTING (vertical cutting) must always be done from the top down.

g. RIPCUTTING (horizontal cutting) must always be done with the direction of the arrow, right to left.

h. ALWAYS wait for the blade to stop completely before changing positions.

i. NEVER REMOVE the skill saw from the frame, except for service by the Maintenance Team.

j. FEEDING material through the machine horizontally or moving the saw carriage material vertically MUST BE DONE SLOWLY, SMOOTHLY AND WHENEVER POSSIBLE WITHOUT STOPPING. OVER FEEDING will cause poor quality cuts and over load the saw motor.

10.2. Setup & Use – Panel Saw

The panel saw can cut:

- To within 1/8" on panel materials up to 1¾" thick (Maximum workpiece thickness)
- Maximum crosscut width is 60"
- Maximum workpiece height is 64"
- Rip cuts can be any length one wants, as long as there is physical room around the placement of the mechanism and proper support provided.

10.2.1. General Operating Tips

When you feed the material through the tool horizontally, or move the carriage over the material vertically, **do it slowly, smoothly, and (whenever possible) without stopping.** Overfeeding results in poor-quality cuts, shortened blade life, and motor overloading.

Be careful when setting material onto the rollers. **Do not drop heavy material onto the rollers** or damage to the rollers may result.

Place the workpiece onto the tool with its back side facing you, this provides the smoothest possible cut on the face side of the panel. As a circular saw blade cuts up through wood, the fibers on top splinter off, a condition known as tear-out (usually worse on cross-cutting). If you must cut the board face-up or if both sides will show, score the cut line with a utility knife before cutting.

Panels being cut HORIZONTALLY must always be fed RIGHT to LEFT and VERTICALLY from TOP to BOTTOM. This way they are fed against the rotation of the saw blade.

Panel saws are intended for cutting **large** panels down to size. As the overall panel size becomes smaller and smaller, other types of sawing tools become more convenient and safer to use.

10.2.2. Operating Procedure: Crosscutting (Vertical Cutting)

WARNING: To reduce the risk of injury, do not place your hands on or under the carriage or in the path of the saw blade.

A crosscut is a vertical cut that must always be done from the top to the bottom of a workpiece as shown in ***Figure 1***. (See also "General Operating Tips" above.)

a. Position the saw motor in the crosscutting position with the blade oriented vertically. To rotate the turntable, pull out both indexing pins, and pivot the turntable until they snap into the appropriate holes.

b. Loosen the carriage lock and move the carriage to the top of the guides.

c. Place the workpiece on top of the rollers. Be careful not to drop the material on the rollers.

   NOTE: When crosscutting (vertical cuts), the workpiece must be supported on at least two rollers (Figure 1) for safe operation and accurate cutting.

d. Slide the workpiece to the desired position, using the crosscut rulers or optional gauging systems (Stop Bar or Quick Stop) as measures.

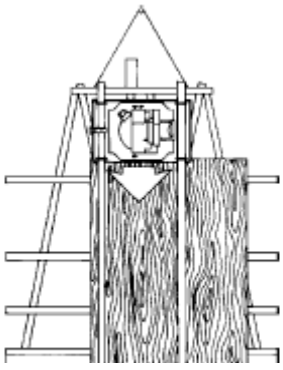


Figure 1. Crosscutting (work supported on at least two rollers)

e. Make certain that the workpiece is adequately supported and stable in the machine. The workpiece can be held with one hand; **do not hold the workpiece so that your hand is anywhere behind the carriage or guides or in the path of the saw blade.**

f. Start the motor (by pulling the outrigger and locking it in the on position) and allow it to reach full speed before beginning the cut. (Stop the motor by pressing the same switch in.)

g. When the motor has reached full speed, slowly and smoothly pull the carriage down so the blade runs through the workpiece. Keep one hand on the handle at all times. Be careful not to force the saw through the workpiece to avoid binding. **If the blade binds in the workpiece, or the workpiece shifts during the cut, stop the motor, carefully move the carriage to the top of the guides, restart the motor, and begin the cut again.**

h. Support and remove the cut-off piece as the saw completes its cut.

i. Once the cut is complete, turn off the motor and wait for the blade to come to a full stop. Move the workpieces away from the blade. Return the carriage to the top of the guides and lock the carriage rip lock.

j. When making cuts that are less than 1", the chatter guard (located inside the blade guard) must be resting on the workpiece, not on the cut-off piece (see ***Figure 2***). If it is not positioned this way, it will jam the workpiece and prevent the carriage from continuing through the cut. If the saw jams, turn the tool OFF and wait for the blade to stop. Then back the saw out of the cut.

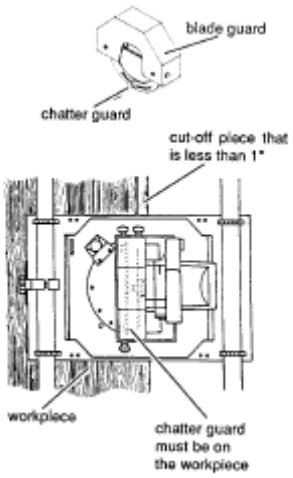


Figure 2. Chatter Preventer (H Series shown, in position for crosscutting)

CAUTION: A coasting saw blade can mar the edge of a freshly cut workpiece.

10.2.3. Operating Procedure: Ripcutting (Horizontal Cutting)

WARNING: To reduce the risk of injury, ripping must always be done with the direction of the arrow on the saw.

A ripcut is a horizontal cut from the right to the left, as shown in ***Figure 3*** and ***Figure 4***. Ripcuts **must always** be done by moving the workpiece in the direction of the arrow on the saw carriage. (See also "General Operating Tips" above.)

a. Before you begin, be sure there is enough space on both sides of the saw to completely load the workpiece on the saw frame, move it past the saw, and completely off-load it.

k. Set the ripping direction to be from right to left. Then rotate the turntable to the ripping position as shown. To rotate the turntable, pull out both indexing pins, and pivot the turntable

until they snap into the appropriate holes. The rip measurement is set at the factory for cutting right to left.

b. Adjust the position of the spring-loaded saw foot to the thickness of the material so that it gently presses on the face. Use the two adjusting knobs located above and below the saw motor.

c. Select the height of the saw blade above the rollers. Raise or lower the carriage until the height index tab is aligned with the corresponding dimension on the vertically mounted ruler. Lock the carriage securely to the guides in this position.

d. Position the material on the RIGHT side of the machine indicated by the arrows on the carriage that show direction of cut. Place the workpiece on top of the rollers. Be careful not to drop the material onto the rollers.

NOTE: Pieces shorter than 4 feet can be rotated 90° and be crosscut.

e. Start the motor (by pulling the start-stop switch out) and allow it to reach full speed before beginning the cut. (Stop the motor by pressing the same switch in.)

f. When the motor has reached full speed, slowly and smoothly push the workpiece through the saw, in the direction of the feed arrow on the saw. **Avoid placing your hands, clothing, or body parts under the carriage or in the cutting path of the saw blade. Do not look directly down the line of cut because dust and debris are generated during this operation.**

g. Be careful not to force the workpiece through the saw to avoid binding. If the saw blade binds in the workpiece, or the workpiece shifts during the cut, **STOP the saw motor, carefully back the workpiece out of the saw, reposition the workpiece, restart the motor, and begin the cut again.**

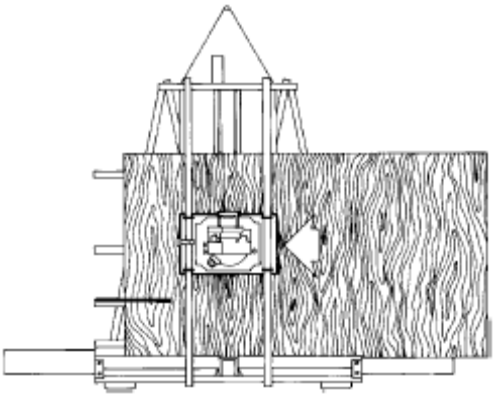


Figure 3. Saw Motor in Ripcutting Position

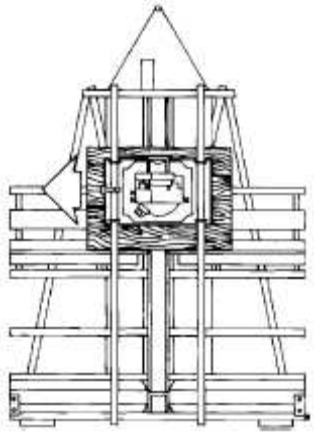


Figure 4. Ripcutting from the Right Using Optional Midway Fence (work extends beyond saw carriage at least 4")

h. As the workpiece passes across the machine, move to the other side and complete the cut by pulling the workpiece past the saw blade. Support the upper piece to keep it from pinching the blade or the kerf protector, or falling away from the machine.

NOTE: When doing rip cuts, one gets the most accurate cut if 1/8" shims are inserted along the way – to keep the top part of the wood from binding the blade.

i. Once the cut is complete, turn off the motor and wait for the blade to come to a full stop. Remove the workpieces from the machine.

j. Rotate the turntable back to the vertical position and return the carriage to the top of the guides. Lock the carriage in this position.

k. When making cuts that are less than 1", the chatter guard (located inside the blade guard) must be resting on the workpiece, not on the cut-off piece. (see ***Figure 2***). If it is not positioned this way, it will jam the workpiece and prevent the carriage from continuing through the cut. If the saw jams, turn the tool OFF and wait for the blade to stop. Then back the saw out of the cut.

11. SAW, SCROLL (30" General International Excalibur EX30)

(NOTE: Portions of the information presented in this section were taken from the General International Excalibur Operating Manual.)

A scroll saw is a small electric or pedal operated saw useful for cutting intricate curves; it is capable of creating curves with edges..

11.1. Safety Precautions

a. CLEAR TABLE before turning saw "on". DO NOT cut material too small to be safely supported or handled. Keep your finger out of line of cut and at least 2" from the blade.

b. AVOID AWKWARD HAND POSITIONS where a sudden slip could cause a hand to move into the blade. ALWAYS keep hands and fingers away from the blade.

c. DO NOT ATTEMPT to saw material that does not have flat surfaces or suitable support.

d. MAKE RELIEF CUTS before cutting long curves.

e. ALWAYS HOLD the work firmly against the table. DO NOT feed the material too fast while cutting. Feed as fast as blade will cut.

f. WHEN CUTTING A LARGE WORKPIECE, make sure it is supported at table height.

g. USE CAUTION when cutting material of irregular cross section which could pinch the blade. For example, a piece of molding must lay fiat on the table and not be permitted to rock while being cut.

h. USE CAUTION when cutting round material such as a dowel rod. They have a tendency to roll causing the blade to "bite", so use correct support.

i. NEVER perform layout, assembly or set-up work on the table while the saw is running.

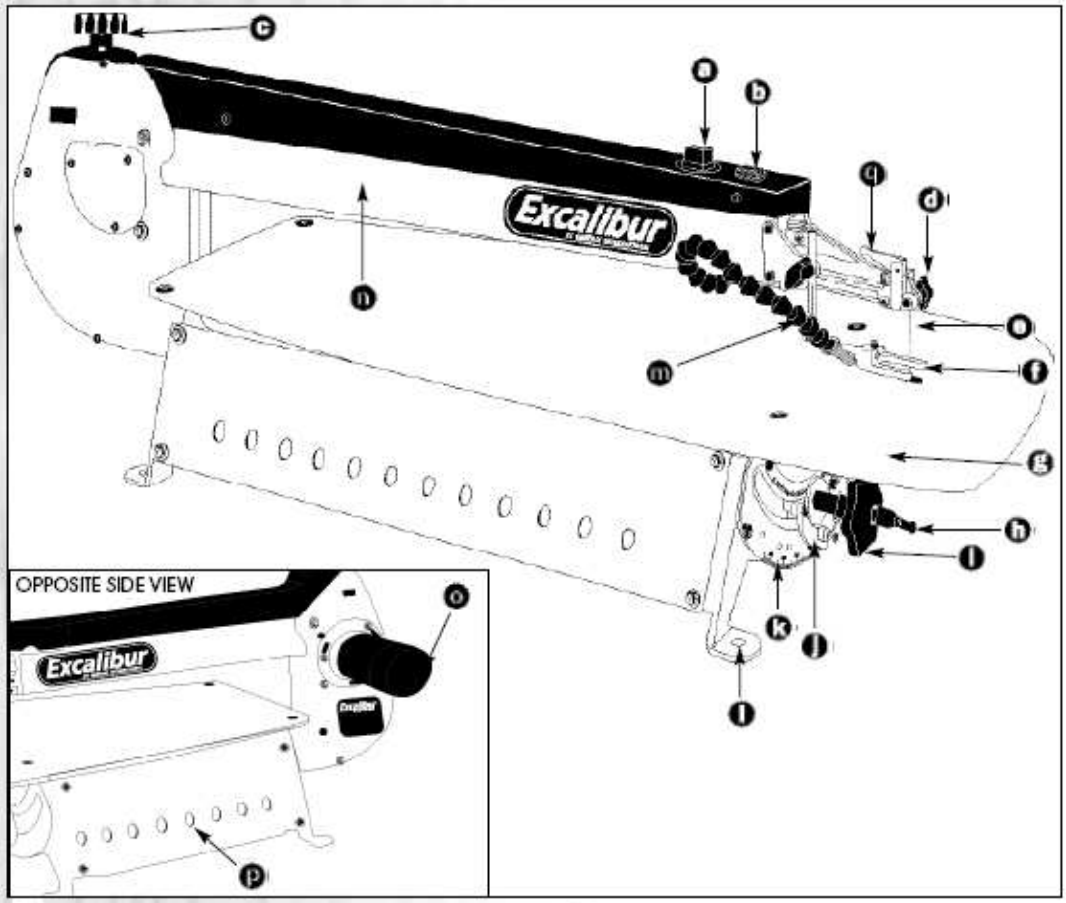
j. TURN OFF the saw before backing out material.

k. NEVER START THE MACHINE WITH THE WORKPIECE AGAINST THE BLADE. The workpiece can be thrown, causing injury.

l. ADJUST THE "HOLD-DOWN" FOOT FOR EACH NEW OPERATION. Loss of control of the workpiece can cause injury.

m. NEVER BACK A BOUND BLADE OUT OF A KERF with the saw running. Turn the saw "OFF", disconnect the saw from the power source, wedge the kerf and remove the blade. Breaking blades can cause injury.

IDENTIFICATION OF MAIN PARTS AND COMPONENTS



- a VARIABLE BLADE SPEED CONTROL KNOB
- b ON/OFF SWITCH
- c UPPER ARM TENSIONER
- d BLADE CLAMP
- e BLADE
- f WORKPIECE HOLD DOWN
- g TABLE
- h BLADE TILT LOCKING LEVER
- i TILT HANDLE
- j ANGLE INDICATOR
- k ANGLE ADJUSTMENT SCALE
- l MOUNTING HOLES (4)
- m BLOWER
- n UPPER ARM
- o MOTOR
- p BLADE HOLDER SOCKETS
- q BLADE TENSION LEVER

11.2. Setup & Use – Scroll Saw

The scroll saw uses two parallel link arms, one above and one below the table, to drive the blade – since both arms drive the blade with equal force, minimal blade deflection makes cuts more precise.

- ON/OFF foot switch controls the variable speed, constant torque motor.
- Cuts to center of 5' long workpieces with 30" throat; material up to 2" thick.
- Uses 5" or 6" plain end blades which can be found in the cabinet where the screws and sandpaper are stored (for a nominal fee, or bring your own).
- 12" x 17" table tilts 45° left and right.

11.2.1. Patterns & Photocopies

If using paper patterns, make photocopies to preserve your original pattern. Most photocopiers distort, so carefully check your photocopy against the original. Make any adjustments to your pattern before cutting.

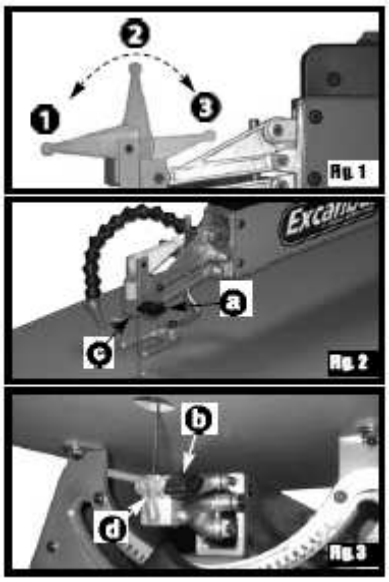
Always spray the PATTERN and not the wood to attach the pattern to the wood. If you spray the wood, you'll have a terrible time removing the pattern.

11.2.2. Installing a Blade

a. Flip the blade tension lever forward (position **1**), then loosen the thumbscrews **(a)** and **(b)** on the upper and lower blade mounts **(c)** and **(d)** (see ***Figures 1 to 3***).

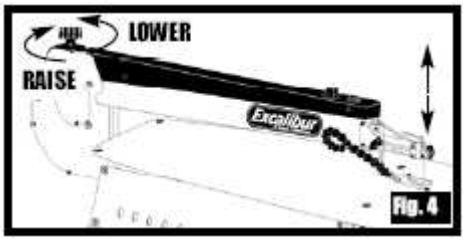
b. With the blade teeth facing forward and pointing down, slip one end of the blade through the hole in the table and fit each end of the blade into the corresponding upper and lower blade mounts, then tighten the thumbscrews firmly by hand only – do not use tools.

NOTE: *Over-tightening the blade clamp thumbscrews can cause premature wear to the blade gripping surface and result in blade slippage.*



c. Push the blade tension lever back (position **3**) to apply tension on the blade.

d. This saw has an adjustment knob in the rear that can raise the blade mount up to 1" – see ***Figure 4***. This allows you to reposition the saw blade at a point where you can use a different part of the blade in the cutting area. This also allows you to use a piece of band saw blade cut to a length of 5"- 6" in your saw and gives you up to 3" cutting capacity when needed.



11.2.3. Helpful Hints on Blade Tension

Determining correct blade tension is somewhat subjective. It is learned through experience and is somewhat dependant on personal preference. A properly tensioned blade will last longer and be much less likely to break prematurely. If the blade tension is too loose, you will notice that the blade will have a tendency to drift a lot or slip off-line when cutting and you may also experience excessive vibration or unusual noise. A blade that is too tight will break prematurely.

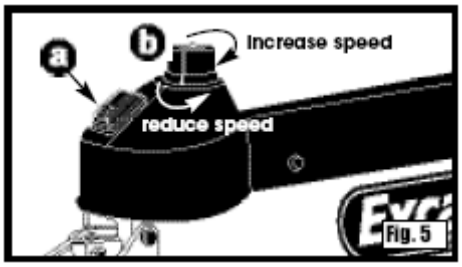
Assuming the blade has been properly installed in the blade mounts, when the blade tension lever is pushed fully back towards the rear of the saw, the blade should be properly tensioned.

Test the blade tension by lightly plucking on the blade, like you would a guitar string, with your finger. With practice, you will eventually be able to feel if the blade is tight and tensioned correctly. Once properly tensioned, you are ready to proceed to operating and cutting with the saw.

NOTE: *Do not over tension the knob as this can cause premature wear and damage to the machine.*

11.2.4. Operating Instructions

A simple, dust protected rocker style on/off switch **(a)** is located on the top of the saw (see ***Figure 5***). An ON/OFF foot switch controls the variable speed, constant torque motor.



The Ex-30 Scroll Saw is equipped with a variable blade speed control which allows you to select or fine-tune to the exact blade speed required (from 400-1550 strokes per minute) for best results based on the type and thickness of material and type of blade being used.

The blade speed control knob **(b)** is located on the top of the machine. (see ***Figure 5***)

- To increase blade speed, turn the control knob clockwise.
- To decrease blade speed turn the control knob counter clockwise.

Blade speed selection is subjective and is dependent on a variety of factors: type and thickness of material being cut, type of blade that is being used, feed rate, required finish quality as well as experience, personal preference and comfort level of the user. There are no hard and fast rules. Be patient – practice and experience will be your best teacher.

Here are some general guidelines to consider when selecting/adjusting blade speed:

- For best results and smoothest most efficient cutting, always select the highest blade speed that you are comfort able using based on your experience and skill level.
- Generally speaking, harder or denser workpiece material requires slower blade speeds.

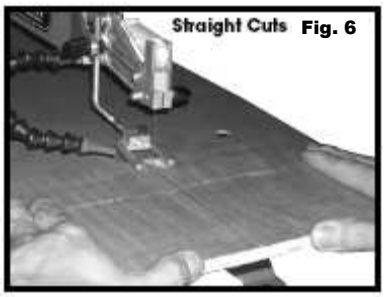
- Slower speeds also work better with very thin blades, or when cutting most metals as well as for brittle or delicate material such as fine veneers.

- Some wood species will have a tendency to burn quicker at higher blade speeds. To avoid additional sanding later, reduce blade speed and feed speed at the first signs of burn marks on the workpiece.

11.2.5. Making the Cuts

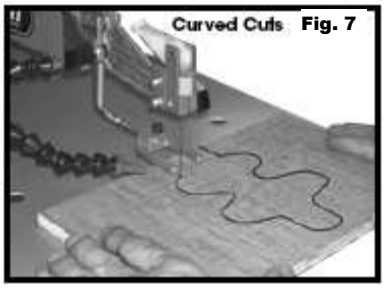
a. Turn on the saw and set the speed controller to the desired blade speed.

b. With your fingers holding the piece firm to the table, and using your thumbs for directional control, (see ***Figure 6 & 7***) feed the workpiece into the blade using steady, even pressure.



c. Make sure that the blade is cutting on the waste side of your reference line and adjust feed direction slightly as needed to compensate for blade drift.

d. As you begin cutting, keep firm but not-white knuckled pressure on the wood. If you don't keep firm pressure on it, the blade will get a hold and rapidly move it up and down against the table's surface. This is called "chatter." Besides scaring you the first time it happens, you can damage the piece you're cutting.



e. You'll probably notice when you start to cut that you can't seem to saw in a straight line. Due to the manufacturing process, there's a slight burr on one side of the blade. To compensate, take a scrap piece of wood and cut into it to see the direction the blade is cutting. Shift your body position relative to this line so as you push the blade into the wood, you'll be cutting straight again. (If the drift is large, you may not have enough tension on the blade.)

f. To stay in control on tight curve cuts, slow down your feed rate as needed to allow the blade teeth time to make the cut. Avoid coming to a complete stop whenever possible as this can leave burn marks on the workpiece and also makes it more difficult to get the piece re-started and moving through the cut again. Avoid forcing through a curve cut as this can cause the blade to twist and cut off-track or may even cause the blade to break.

12. SAW, TABLE – (3 ¼" Microlux 80463)

Even though this is smaller than the machines on the general shop floor, all the same precautions apply. This machine can cut you and give you kickbacks just as much as the saws on the floor.

12.1. Safety Precautions

a. CHECK the BLADE for sharpness and secure fastening to the arbor before machine is turned on.

b. ADJUST BLADE height so it is approximately 1/8" above the surface of the wood being cut.

c. KEEP HANDS out of the path of saw blade.

d. NEVER REACH around the blade while it is running.

e. BE SURE to keep workpiece securely against the miter gauge or fence.

f. SHOULD ANY PIECES GET CAUGHT in the blade guard or in the slot in the table top, turn off saw and unplug cord before removing.

g. IF THE BLADE SLOWS down while cutting, you are feeding too fast.

h. WHEN CROSS CUTTING:

- Remove rip fence and ALWAYS USE MITER GAUGE.
- Hold the wood securely against the face of the miter gauge with one hand. Grasp the miter gauge lock knob with the other hand, keeping your hand away from the blade.
- To support extra long stock when cross cutting, pull out the table extension and swing extension support leg down.

i. WHEN RIPPING:

- Remove miter gauge and ALWAYS USE THE RIP FENCE.
- If the wood does not have a straight edge to ride along the rip fence it can bind and cause a kickback.
- Use two push sticks, one in each hand, to push short or narrow workpieces past the blade. Use one stick to push the stock and hold it down to the table. Use the other push stick to hold the stock against the fence.

12.2. Setup & Use – 3 ¼" Table Saw

This saw can be used for either CROSSCUTS or RIPCUTS.

Features:

- Variable speed, from 3,600 to 7,000 rpm
- Tilting arbor for angle cuts up to 45 degrees
- While it can cut a full 1" at 90 degrees and 3/4" at 45 degrees, our preference is that only wood 1/2" or thinner be cut on this saw and that the blade be kept at 90 degrees
- Blade: 80 tooth fine cut, 3-1/4" diameter, 10mm hole
- Blade height adjusts from 0 to 1"
- 11-1/2" x 9-1/2" table with 9-1/2" x 9-1/2" machined aluminum surface
- Calibrated miter gauge and 2 miter gauge slots for cutting from left or right side of blade

The fence on this saw is different than the fences on the bigger saws. On this saw, you set the fence in position, screw down the front of it, and then screw down the clamp on the back. If you don't secure both the front and the back you will not get straight cuts and you will increase the risk of kickback.

The guard on this saw is also less capable than on the bigger saws. Most often, you will have to remove the guard to use this saw. Thus the risk of kickback is high.

In all other respects, this is just a smaller version of the larger table saws and one should look at *Section 7. Table Saw* for more information.

13. BISCUIT CUTTER/ PLATE JOINER (Porter-Cable 557, Ryobi JM81, Ryobi DBJ50)

(NOTE: Portions of the information presented in this section were taken from the Porter-Cable Operating Manual.)

This specialized mini-saw cuts thin slots in the edges of wood to hold a biscuit, which is used to hold two pieces of wood together.

You can use biscuit joinery for a number of different types of joints. Smaller biscuits work well for strengthening miter joints and corner joints. Biscuits also work well for T-joints, where the end grain of one board is connected to the side of another board. The most common use for biscuits is to edge join boards to make wider boards.

We have three biscuit cutters in the shop, two full-size and one mini-biscuit cutter. Only one unit is presented herein, as the principles and general operation and adjustments are similar for all three.

13.1. Safety Precautions

a. Use clamps or other practical way to support the workpiece and secure it to a stable platform.

b. Check for misalignment or binding of moving parts or breakage.

c. Guard against kickback:

- Hold the unit firmly against the project before energizing.
- Make sure the motor is at full speed before plunging.

d. Disconnect the plug from the power source before making any adjustments.

e. Never apply side pressure to slow down a spinning blade.

13.2. Biscuits

A biscuit is a thin, oval-shaped piece of compressed wood shavings, typically made from beech wood. Biscuits are glued into slots precisely cut by the biscuit cutter, and the moisture from the glue causes the biscuit to swell and tighten the joint. The Woodshop has biscuits for sale in the cabinets.

Biscuits commonly come in three sizes:

- #0 - 5/8" x 5/8” thick
- #10 - 3/4" x 5/8” thick
- #20 - 1" x 5/8” thick

Use the largest size biscuit when working with large projects, as this will provide the greatest amount of strength to the joint. In most cases, use #20 biscuits, but when working on narrower material, switch to smaller biscuits where appropriate.

13.3. Setup & Use – Biscuit Cutter

Practice Cuts Highly Recommended! After each set-up or adjustment to the tool, make several practice cuts in scrap material to verify desired operation.

13.3.1. To Start & Stop Tool

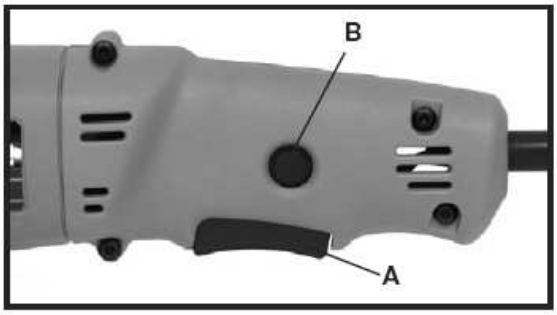


Fig. 1

a. Connect tool to power circuit.

b. Grip tool firmly to resist starting torque, and squeeze trigger switch (A) ***Figure 1***, to START tool.

c. Release trigger switch to STOP tool.

d. Switch Lock: the trigger switch may be locked in the "ON" position as follows:

- Squeeze trigger switch to START motor and depress lock button (B) ***Figure 1***, while releasing trigger switch. Release lock button.
- To STOP tool: squeeze trigger switch and release, while leaving lock button free to spring out.

13.3.2. Adjusting Depth of Groove

A "quick set" depth adjusting turret (A) ***Figure 2***, provides for quick changes in depth of cut to accommodate the various sizes of available biscuits and other accessories. To set depth of cut: rotate depth adjusting turret until desired size marking on turret aligns with the index mark (B) ***Figure 2***. The following depth settings are provided:

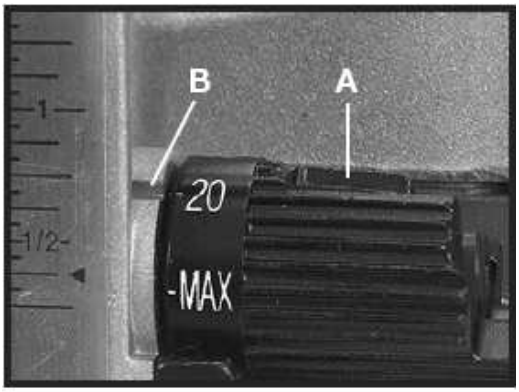


Fig. 2

0 For "0" size biscuits

10 For "10" size biscuits

20 For "20" size biscuits

13.3.3. Height Adjustment using Adjustable Fence

See ***Figure 3*** and ***Figure 4***:

a. Loosen locking knob (A), and rotate knob (B) to position the fence as desired, (rotate knob clockwise to raise fence, rotate knob counterclockwise to lower fence).

b. The depth scale (C) indicates the distance from the top edge of the workpiece to the blade: ***NOTE:*** *The bottom line on scale (C) begins at 1/4" and all lines are in 1/16" increments.*

- The line across the center of the index block (D) indicates the distance to the center of the blade.
- The top edge of the index block (D) indicates the distance to the bottom of the blade.
- The bottom edge of the index block (D) indicates the distance to the top of the blade.
- The width of the index block (D) is equal to the thickness of the blade.

c. Once fence is in desired position, tighten knob (A) to secure in place.

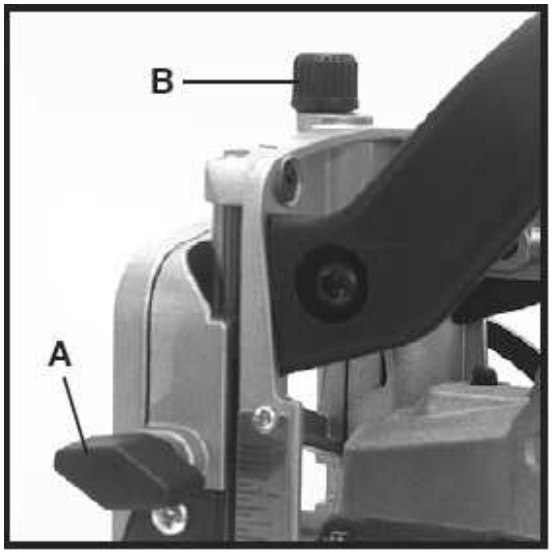


Fig. 3

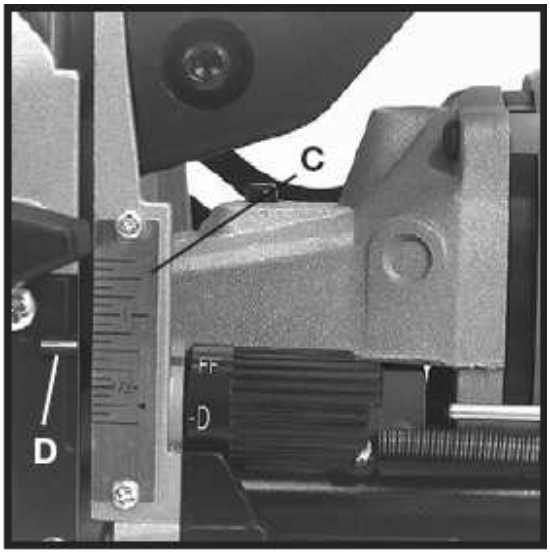


Fig. 4

13.3.4. Angle Adjustment using Adjustable Fence

See ***Figures 5, 6, 7 and 8***:

a. Loosen locking knob (A).

b. For angles between 0° and 90°: swing fence downward until desired angle on lower scale (B), aligns with lower index mark (E). Tighten knob (A), to secure in place.

c. For angles between 90° and 135°: swing fence downward until the “gate” between the upper scale (D), and lower scale (B), aligns with locking knob. Swing scale arm down to align knob with upper scale. Move fence until desired angle on upper scale (D), aligns with upper index mark (C). Tighten knob (A), to secure in place.

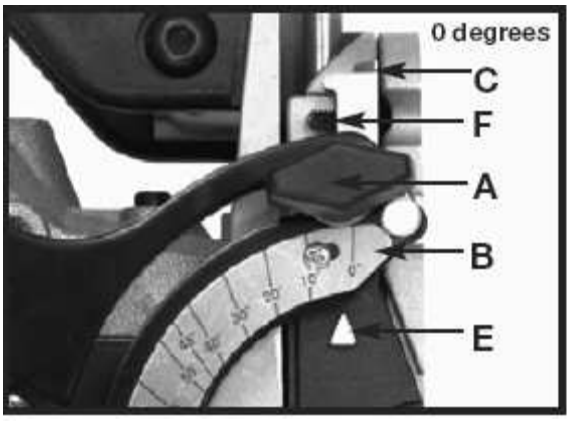


Fig. 5

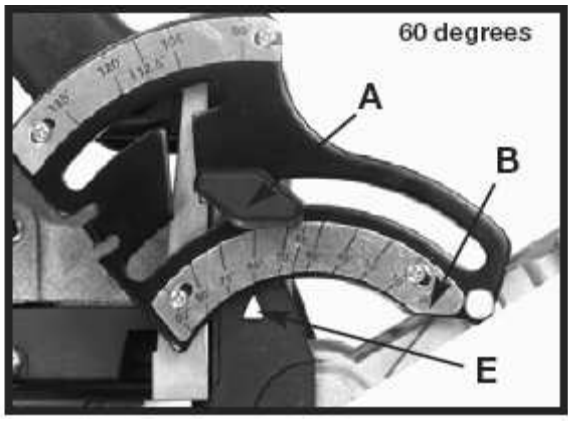


Fig. 6

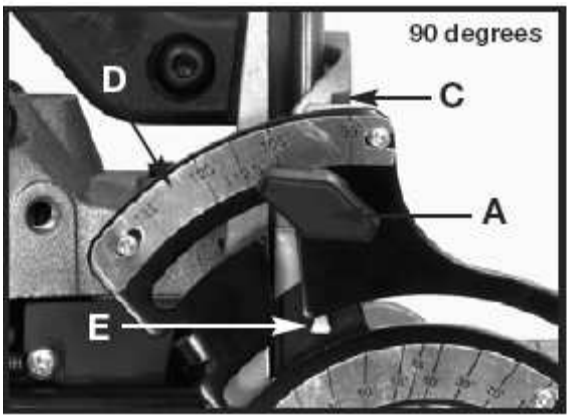


Fig. 7

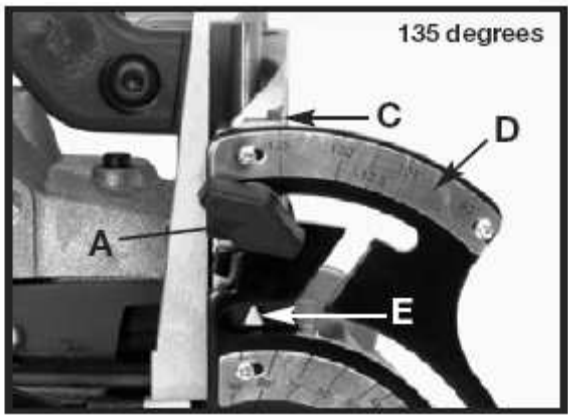


Fig. 8

13.3.5. Positioning Grooves for Biscuits

The number of grooves (biscuits) used in a joint may be varied to provide the strength required for the particular application. Typically, the center of the first groove is positioned approximately 2" from the edge of the work with additional grooves spaced at 3" to 6" on centers, or for longer boards every 12" to 18".

In most cases, one line of grooves (biscuits) positioned approximately along the centerline of the material is used. On thicker material, an additional row(s) of biscuits may be used for added strength. The possibilities are almost endless.

To ensure proper alignment of joined wood, position the two workpieces (see ***Figure 9***) in the relationship desired after joining. Mark the centerline of each groove required to mark the position for the biscuit joiner. Use a square to assure accuracy.

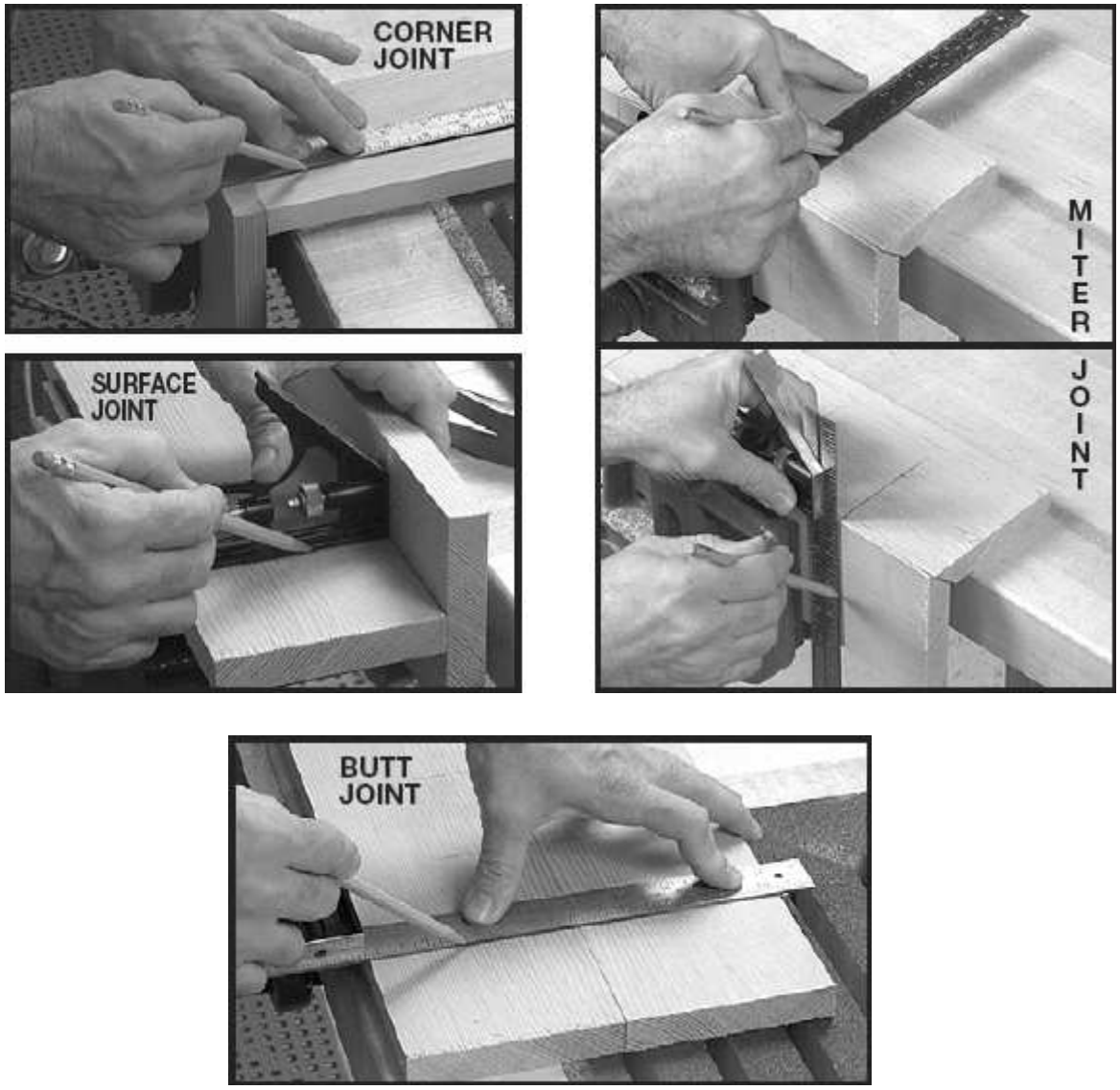


Fig. 9.

13.3.6. Butt Joint – Connecting the Edges of Two Boards

Begin by checking the boards to make sure that they will line up properly.

a. The two pieces of stock should be of the same thickness and should make consistent contact across the entire length of the joint. Whenever possible, complete a pass through a jointer to machine-plane the two pieces of stock to ensure that you have two straight edges. Once you have two straight-edged boards, place them on a work table in what will be their final positions.

b. Next, choose your biscuit size, #20 is the larger biscuit and is normally used for boards that are about 3/4" thick.

c. With a pencil, make a few small, evenly-spaced marks across the joint to denote the location of each biscuit on each board. Now, set one board to the side.

d. Using the biscuit joiner, place the guide fence flat on the top of the stock and line the cutting guide with one pencil mark.

Fig. 10

<u>Prevent Alignment Errors</u> (Figure 10): It's easy to misalign a slot with both your hands on the joiner's handles. Working that way, you can't feel whether the fence is fully in contact with the stock. The slightest shift up or down on the handle can cause the biscuit slot to be cut wrong. Use one hand to hold the fence down onto the board and you'll eliminate errors. ***(from: "12 Tips for Better Biscuit Joining" by Richard Tendick)***

e. Start the saw and plunge the blade into the stock up to the stop. Remove the blade and repeat at each mark. Be certain that the motor is at full speed before plunging, and never apply side pressure to slow down a spinning blade. Also be sure to push forward until the depth adjustment stops the forward motion to ensure the full depth is cut each time.

f. Once the cuts are completed in one board, switch to the other board and cut the corresponding slots.

g. When all cuts are finished, make sure all sawdust is removed from the grooves so biscuits properly seat.

h. <u>Dry Fit the Biscuit before Gluing</u> (***Figure 11***): Don't use a biscuit that fits loosely in the slot. All you'll get is a weak joint. Dry-fit biscuits in their slots before glue-up. The biscuit should slide into the slot with hand pressure. Then, hold the board so the biscuits are hanging. A biscuit that is too loose will fall out. Don't forget to test the other side of the joint in the same way. If you have a slot that's too big for any biscuit, glue a shim into the slot and then recut the slot. ***(from: "12 Tips for Better Biscuit Joining" by Richard Tendick)***

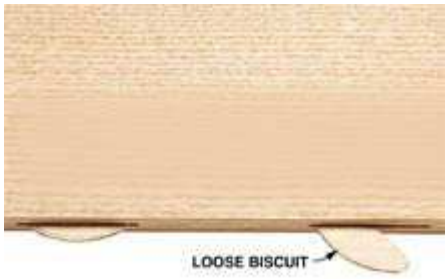


Fig. 11

i. Place some glue in the slots of one board and insert a biscuit in each slot. Spread glue on the entire edge of the board. Then, put glue in both the slots and on the edge of the other board, then slide the second board onto the biscuits. Glue must be evenly applied throughout the biscuit slot and to the entire edge of both the boards to get the strongest joint possible. The

easiest way is to squirt some glue into the slot and then run a glue brush through the slot until the glue is evenly coated on all surfaces.

j. Use clamps to hold the joint while the glue dries, but take care that you don't tighten the clamps so much that you squeeze all of the glue out of the joint.

k. Remove dust from the dust bag.

13.3.7. Corner Joints

a. Layout groove positions as described in *Section 15.3.5 Positioning Grooves for Biscuits*.

b. Set depth stop turret to desired biscuit size.

c. Set the tilt fence to the 90° position (see *Section 15.3.4 Angle Adjustment*).

d. Set fence height adjustment to desired height (usually 1/2 the material thickness), (see *Section 15.3.3 Height Adjustment*).

e. Clamp the workpiece securely.

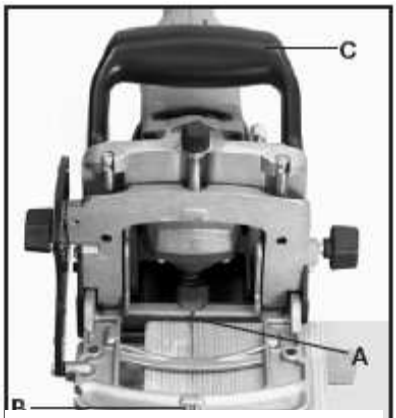


Fig. 12

Fig. 20

f. Position tool to workpiece with bottom of fence resting on workpiece. Align guide notch (A) or (B) ***Figure 12***, with a groove centerline. Apply pressure to auxiliary handle (C) ***Figure 12***, to keep the front of tool and fence in firm contact with workpiece.

g. Hold tool firmly as shown in ***Figure 13***, squeeze trigger switch to start tool.

h. At a slow, steady pace, push tool forward in base as far as depth stop allows.

i. Release trigger switch to stop tool and remove tool from work.

j. Repeat steps f. through i. until all grooves for this joint are completed.

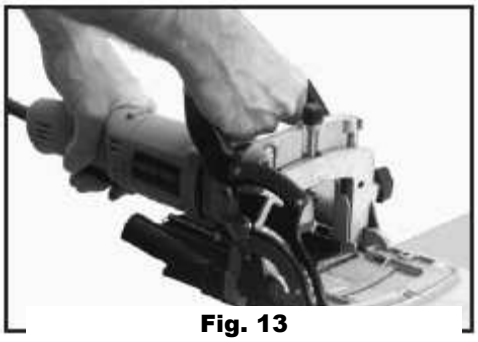


Fig. 13

Fig. 21

k. When finished, remove dust from the dust bag.

NOTE: Assemble all joints and verify alignments before applying glue (see Figure14).

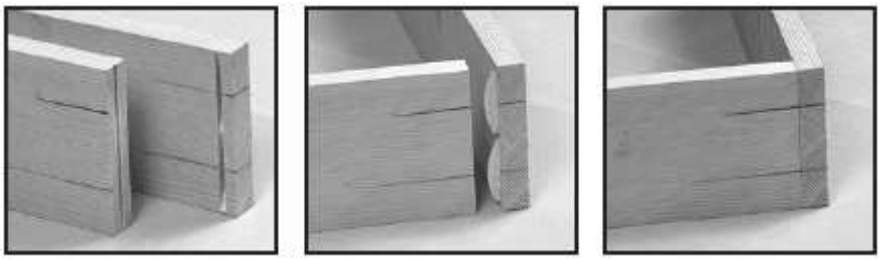


Fig. 14

13.3.8. Surface ("T") Joints

a. Layout groove positions as described in *Section 15.3.5 Positioning Grooves*.

b. Set depth stop turret to desired biscuit (or other accessory), size.

c. Mark centerline of joint on workpiece "A" (see ***Figure 15***).

d. Clamp a straight edge guide to the workpiece, 3/8" back from the joint centerline (as marked in Step 2). Clamp workpiece securely (see ***Figure 16***).

e. Set tilt fence to 0° position (see *Section 15.3.4 Angle Adjustment*).

f. Position tool to workpiece with bottom of base against straight edge and guide notch (C) ***Figure 17***, aligned with a groove centerline. Apply pressure to auxiliary handle (D) ***Figure 17*** to hold tool firmly in place.

g. Hold tool firmly as shown in ***Figure 13***. Squeeze trigger switch to start tool.

h. At a slow, steady pace, push tool forward in base as far as depth stop allows.

i. Release trigger switch to stop tool and remove tool from work.

j. Repeat steps e. through g. until all the grooves in workpiece "A" are completed.

k. Follow steps c. through j. of *Section 15.3.7 Corner Joints* to complete required grooves in workpiece "B" ***Figure 15***.

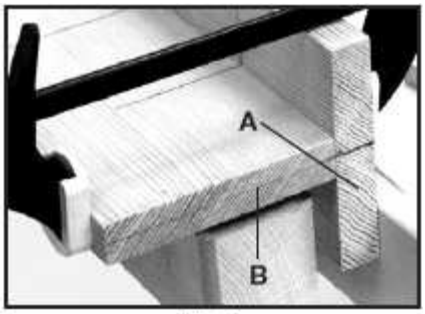


Fig. 15

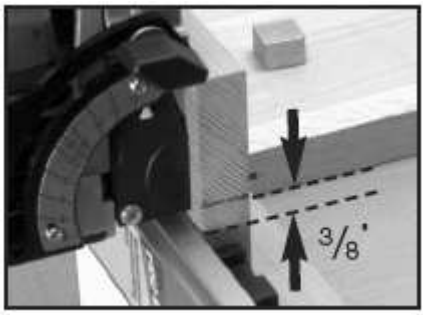


Fig. 16

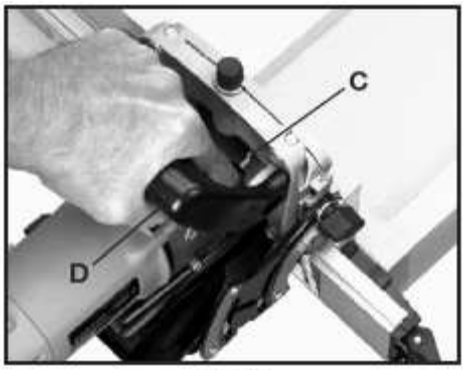


Fig. 17

Fig. 18

NOTE: Assemble all joints and verify alignments before applying glue (see Figure 18).

13.3.9. Miter Joints

a. Layout groove positions as described in *Section 15.3.5 Positioning Grooves*.

b. Set depth stop turret to desired biscuit size.

c. Set the tilt fence to desired angle (see *Section 15.3.4 Angle Adjustment*).

d. Set fence height adjustment to desired height (see *Section 15.3.3 Height Adjustment*).

e. Clamp workpiece securely.

f. Position tool to workpiece utilizing either guide notch (A) or (B) ***Figure 19***, to align tool with a groove centerline. Apply pressure to auxiliary handle (C) ***Figure 19***, to hold tool firmly in place.

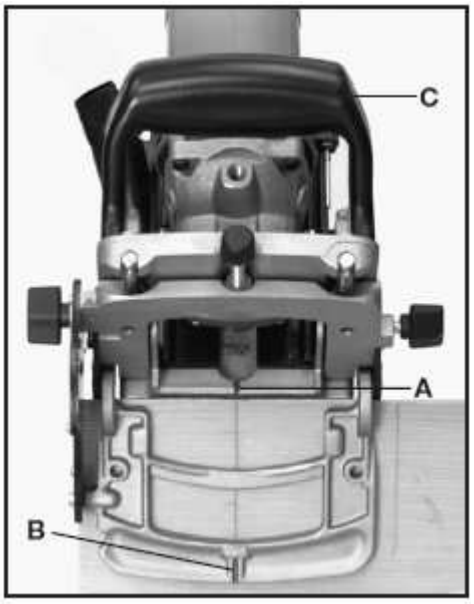


Fig. 19

g. Hold tool firmly as shown in ***Figure 20***, and squeeze trigger switch to start tool.

h. At a slow, steady pace, push tool forward in base as far as depth stop allows.

i. Release trigger switch to stop tool and remove tool from work.

j. Repeat steps e. through h. until all the grooves for this joint are completed.

Fig. 20

NOTE: Assemble all joints and verify alignments before applying glue (see Figure 21).

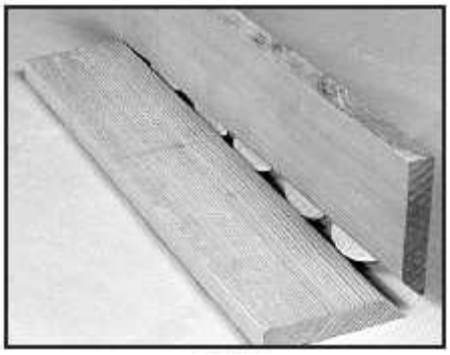


Fig. 21

14. DRILL PRESS, FLOOR STANDING (General International 75-500M1, Central Machinery T-583, Jet JDP-17MF) & BENCH STANDING (Delta 11-950)

(NOTE: Portions of the information presented in this section were taken from the General International Operating Manual.)

We have four drill presses in the shop, one General International 22" floor standing, two Central Machinery 16" floor standing and one 8" bench standing. Only one unit is presented herein, as the principles and the general operation and adjustments are similar for all four.

With a drill press:

- You can preset the depth of your hole and consistently cut numerous holes at the same depth.
- You can use Forstner bits, spade bits and hole saws to smoothly and safely bore wider diameter holes.
- With a floor or bench standing drill press and a long bit, you can bore out very deep holes that would be impossible to get straight with a hand-held power drill.

14.1. Safety Precautions

a. NEVER START THE MACHINE BEFORE CLEARING THE TABLE OF ALL OBJECTS (tools, scrap pieces, etc.). Debris can be thrown at high speed.

b. TIGHTEN ALL LOCK HANDLES before starting the machine. Loss of control of the workpiece can cause serious injury.

c. AVOID AWKWARD OPERATIONS AND HAND POSITIONS. A sudden slip could cause a hand to move into the bit.

d. PROPERLY SUPPORT LONG OR WIDE workpieces. Loss of control of the workpiece can cause severe injury.

e. NEVER PERFORM LAYOUT, ASSEMBLY OR SET-UP WORK on the table/work area when the machine is running. Serious injury can result.

f. HOLD material to be drilled securely; **it is best to use a vise or a clamp**.

g. MAKE SURE drill bit or cutting tool is securely locked in the chuck. Remove chuck key from the chuck.

h. MAKE SURE that you remove the chuck key before starting drill press.

i. TURN THE MACHINE “OFF” AND WAIT FOR THE DRILL BIT OR CUTTING TOOL TO STOP TURNING prior to cleaning the work area, removing debris, removing or securing workpiece, or changing the angle of the table. A moving drill bit or cutting tool cause serious injury.

j. DO NOT drill length of a hole in one plunge. Take several small plunges. Never forcefully drive the drill bit down and through the workpiece in one single pass. On thick wood, pull the bit back out to clean out drill chips and prevent damage to the bit.

k. NEVER start the drill press with the drill bit or cutting tool in contact with the workpiece.

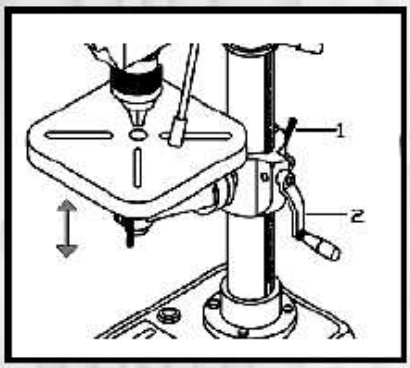
14.2. Setup & Use – Drill Press

Whether using one of the three larger floor standing drill presses or the smaller bench standing drill press, the principles are the same.

14.2.1. Adjusting the Table & Depth Stop

Whenever you are adjusting or moving the table, support the table with one hand and do not rely totally on the cranking mechanism for the required support.

Adjust the table or depth stop as shown below to drill consistant depth holes and to avoid drilling into the table. Also, place a piece of scrap wood underneath the workpiece to protect the table.



ADJUSTING TABLE HEIGHT

1. Loosen the column lock handle (1).
2. Turn the crank handle (2) until the table is at the desired height.
3. Retighten the column lock handle (1) before starting.

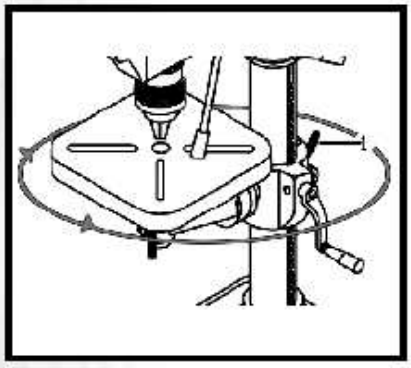


TABLE SWING ADJUSTMENT

1. Loosen column lock handle (1).
2. Swing the table arm bracket and the table to the desired position.
3. Retighten column lock handle (1).

When working with taller work pieces swing the table 180° out of the way and use the base as a table.

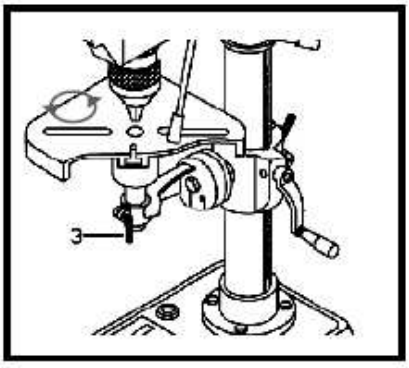


TABLE ROTATION ADJUSTMENT

1. Loosen the table lock handle (3).
2. Rotate the table to the desired position.
3. Retighten the table lock handle (3).

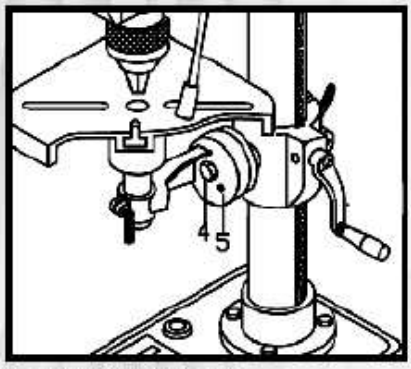
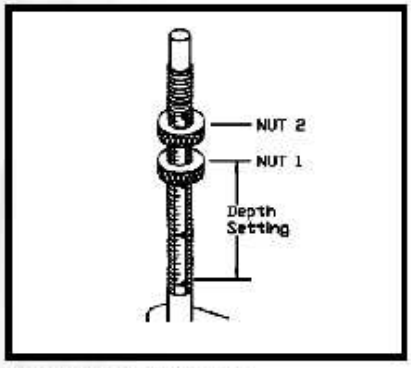


TABLE TILT ADJUSTMENT

1. Loosen the pivot bolt (4) and set screw (5).
2. Tilt the table to the desired angle.
3. Retighten the pivot bolt (4) and set screw (5).



DEPTH STOP ADJUSTMENT

1. Set the bottom edge of nut #1 even with the desired depth setting.
2. Tighten nut #2 against nut #1 to secure it in position.
3. Depth stop is now set and will provide repetitive holes of equal depth.

14.2.2. Drilling

Place scrap wood under work to prevent damaging drill bits and the table, and to prevent tear out of your work.

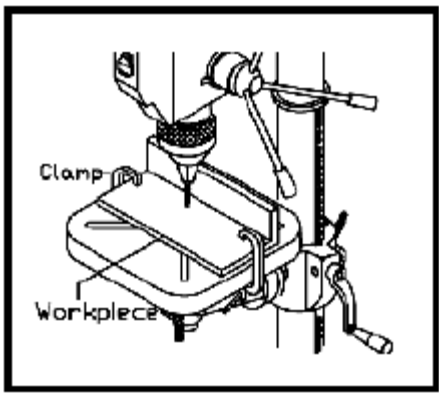
Make sure that recommended speed is satisfactory for the drill, accessory and workpiece material. Wood drill bits operate at 550-600 RPM. To adjust the speed, make sure that power is off, raise the top cover and follow the instructions on the inside of the cover. Normally, the smaller the bit, the higher

the speed and the larger the bit, the slower the motor speed. *(NOTE: The 22" General International's cover is screwed shut and cannot be changed)*

The workpiece should never be held only by hand; always use hold-downs or clamps to secure the workpiece. When you need to drill a hole in a round piece of stock such as a turned leg or dowel, use a v-shaped jig to hold the stock in place while drilling. Clamping your workpiece to your drill press table will also allow you to drill an offset hole.

Take care to use clean, sharp bits. Damaged or broken bits could result in serious injury. When drilling flat work, place the workpiece on a wooden base and clamp it down against the table.

When drilling wood, you may need to pull the drill out periodically as the drill bit will probably clog. By pulling the drill bit partially out of the work while the bit is turning, it will self clean. If the drill bit does clog (usually from pressing too hard and too fast), then pull the bit out, turn machine off, wait until bit stops and then clean the clog out with a hard material such as a screwdriver or nail.



When you need to drill holes in the same spot on a number of pieces of stock, clamp a fence with a stop block in position on the table of the drill press. Then you can place each piece of stock against the stop block and drill the hole.

14.2.3. Methods for Preventing Tear Out

When drilling large-diameter holes with a spade (or paddle bit), hole saw or other large diameter bit, one of the most common problems occurs when the bit "blows through" the back side of the stock, tearing the face of the stock, leaving a very ugly problem to deal with. However, there are two very simple methods for solving this troublesome issue:

- Clamp a block of hardwood to the back side of the stock before drilling. When the bit approaches the end of the cut, it will be far less likely to blow through with another piece of wood to drill. However, if the stock placed on the back side is softer than the workpiece, or if it is not securely clamped to the workpiece, tear out can still occur.

- Another, perhaps simpler method is to drill half-way through the stock, until the pilot hole just penetrates the back side of the workpiece, then flip the workpiece over and drill back toward the front side. In this manner, any possible blowout would occur in the middle of the stock as opposed to either edge, leaving a much cleaner cut on each side.

15. GRINDER, BENCH (8" GRINDER 144290, 6" Delta 23-645)

The bench grinders are provided for sharpening of the woodturning & woodcarving tools. All other required sharpening is performed by the Maintenance Team ONLY!

Two bench grinders motors are provided in the Woodshop:

- The 8"grinder setup by the lathes has white wheels and is for sharpening the lathe tools only.
- The 6" Delta grinder is setup on the shop floor with buffing wheels.

15.1. Safety Precautions

a. NEVER use a chipped or cracked grinding wheel as it can explode!

b. NEVER grind on a cold wheel. The grinder must always be started and run at idle speed for one full minute before applying work.

c. NEVER grind on the side of the wheel, use the face of the wheel only.

d. NEVER grind aluminum, brass, bronze or copper as heat buildup can cause the wheel to explode.

e. ALWAYS maintain a distance of 1/8" or less between the grinding wheel and the tool rest.

f. SECURELY tighten tool rests so they cannot shift position while in use.

g. KEEP the spark guards close to the wheel and readjust them as the wheel wears.

h. DO NOT USE A WHEEL THAT VIBRATES. Unsuitable grinding wheels can come apart, throwing fragments at high speeds.

i. STAND TO ONE SIDE before turning the machine ON. Loose fragments or wheel parts could fly from the wheel at high speeds.

j. NEVER START THE MACHINE with the workpiece against the grinding wheel. The workpiece can be drawn into the wheel, causing damage to the machine and/or serious injury.

k. DO NOT TOUCH the ground portion of a workpiece until it has cooled sufficiently.

l. IT IS RECOMMENDED THAT YOU WEAR A FACE SHIELD WHEN GRINDING. Loose bits of the grinding wheel frequently become dislodged and strike your face and eyes.

m. NEVER PERFORM LAYOUT, ASSEMBLY, or set-up work on the table/work area when the machine is running. A sudden slip could cause a hand to move into the wheel. Severe injury can result.

15.2. How to Sharpen

Bench grinders require a steady hand, concentration on the task and good lighting to prevent serious injury.

15.2.1. Setup

The 8" lathe tool grinder uses white, friable aluminum oxide grinding wheels that are designed to sharpen high speed steel turning tools. It will also sharpen carbon steel turning tools. The **LEFT wheel is COURSE 60 grit** and the **RIGHT is FINE 120 grit**. This slow speed grinder is great for sharpening tools without generating the tool destroying heat that you get so quickly from 3450 RPM grinders.

15.2.2. How to Use

Apply your safety gear, which should include face and eye protective wear. Plug the grinder in, stand to the side of the wheel and then turn it on. Let the grinder get its speed up before you move in front of the wheel.

Stand in front of the grinding wheel, holding the tool or part you are going to grind securely against the tool rest. When grinding all tools only the **very lightest weight** should be applied in order to avoid overheating the edge. Very often the weight of the tool on the grinding wheel provides enough pressure.

- Begin to move it slowly and smoothly forward until it contacts the wheel. Prolonged contact between the wheel and the tool should be avoided to prevent overheating the edge.
- Extreme changes in temperature may cause metal to become soft or brittle, so the goal is to keep the metal from getting too hot. If considerable re-shaping of a tool is required then it must be cooled by dipping the tip in water at frequent intervals.
- Use the coarse wheel for grinding away larger amounts of steel to reshape a tool and the fine wheel to sharpen or touch up the cutting edge.

Overheating becomes apparent when the metal turns blue. When this happens to high speed steel it is not too much of a problem since the steel will not have been softened. But when it happens to carbon steel it means that the temper will have been taken out of the steel and the tool will not hold its edge.

15.3. How to Buff

Buffing a finish brings out the maximum shine and produces a mirror like finish.

The 6" Delta grinder, which is setup with white buffing wheels, can be used to obtain a very high polish on wood finishes.

Applying Compound:

- The **RIGHT wheel is where you apply the RED ROUGE**.
- The **LEFT wheel has no compound** and is used for the final buffing.

- **The ONLY compound allowed to be used is RED ROUGE, also called JEWELER'S ROUGE (RIGHT wheel only).** Applying different compounds to the same wheel causes problems, because you end up with a mixture of abrasives.
- Apply the red rouge block to the edge of a spinning buffing wheel, the heat from the friction melts the wax, and both wax and abrasive are applied in a thin slick to the face of the wheel.
- LITTLE & OFTEN is the rule: Too much compound will reduce the effectiveness of the buffing action, because the surface will become TOO greasy and over lubricated. This can often be seen by the presence of a black slick of compound that seems to reveal around the work piece. Apply compound to the wheel for approx 1 second, any more is wasted.
- You must bring your own rouge; the Woodshop does not provide this.

Buffing:

- Do not rush into any buffing job. Go slowly, and handle complex parts carefully.
- As a safety precaution, use a firm yet flexible grip to hold the workpiece **a little below the wheel's center**. If the wheel grabs the workpiece, it will throw the part away from you.
- Buff on the RIGHT wheel and do a final buffing on the LEFT wheel to remove any residual rouge.
- Moving the piece back and forth releases heat to prevent burning or melting a finish.

16. LATHE, WOOD (20" Powermatic 3520B & 14" Jet Mini Lathe JML-1014)

(NOTE: Portions of the information presented in this section were taken from the Powermatic & Jet Operating Manuals.)

The Woodshop has two woodturning lathes. The smaller Jet lathe is suitable for turning pens, small bowls, and craft projects. The Powermatic lathe is a professional machine capable of turning pieces up to 20" in diameter and 3 feet long. Both lathes share all the accessories needed for almost any woodturning project.

Neither lathe is covered in the Woodshop Orientation Class, therefore:

- **<u>To operate the large Powermatic lathe you are required to complete the Woodshop training class.</u>** See the Shop Monitor for the key to the Powermatic; they will verify you are on the "Approved Users" list.
- The Jet mini lathe is available to all Woodshop members. However, it is highly recommended that you get trained on this lathe by contacting the Woodturning group.

Be sure you are prepared for the task at hand, start slowly and gain confidence as you turn your project.

16.1. Safety Precautions

Adherence to these Safety Precautions, enforced from the outset, will become habit and your wood turning will consistently be a safe and enjoyable experience.

a. EXAMINE WORKPIECE for flaws and test glue joints before placing workpiece in lathe. Do not attempt to turn cracked or split wood, or wood with loose knots.

b. KEEP guards in place.

c. USE SAFETY EQUIPMENT. Always wear eye and face protection, and a dust mask is highly advised.

d. ROUGH CUT THE WORKPIECE as close as possible to the finished shape before installing it on the faceplate.

e. MAKE SURE the tool rest is adjusted properly. Keep the tool rest as close to the work as possible. NEVER adjust tool rest while work is turning.

f. ROTATE workpiece by hand to check clearance and examine workpiece setup carefully prior to engaging power.

g. WHEN TURNING BETWEEN CENTERS make sure tailstock center is snug against the workpiece and locked when turning between centers.

h. WHEN FACE PLATE TURNING, make sure screw fasteners do not interfere with the turning tool at the finished dimension of workpiece. ALSO, be sure material is securely fastened to the faceplate. Support the wood with the tailstock when possible.

i. WHEN ROUGHING STOCK do not jam tool into the workpiece or take too big a cut. Work slowly and check/select proper speed before turning lathe on.

j. NEVER drive wood into the drive center when it is in the headstock. Set drive center into wood with a soft mallet prior to installing into the lathe headstock.

k. NEVER loosen tail stock spindles while work is turning.

l. KEEP YOUR FINGERS and other body parts away from the spinning wood. Hand contact with a spinning workpiece can cause your finger and hand to be jammed into/between the tool rest.

m. REMOVE the tool rest before sanding or polishing.

n. ALWAYS disengage the indexing mechanism before operating the lathe.

o. PROPERLY SUPPORT LONG OR WIDE WORKPIECES.

p. NEVER PERFORM LAYOUT, ASSEMBLY, or setup work on the table/work area when the machine is running.

16.2. Safety Equipment

Proper Clothing: DO NOT wear loose-fitting clothing or long sleeves, to prevent the excess cloth from becoming entangled in the spinning machine. Remove your name badge lanyard to avoid it catching on the rotating wood and pulling you into the lathe. When wood turning, a woodworker's apron will keep flying wood chips away from your body.

Face Shield: A face shield is a must when wood turning, as chips will fly in all directions. A clear, impact resistant full-face shield will provide eye protection and keep these flying chips and debris out of your face, helping you to avoid distraction when turning.

Respirators: When turning some woods, particularly fine imported woods such as mahogany or rosewood, it is advisable to wear a dust mask or a respirator, as the fine dust generated by turning these woods can cause irritation to the lungs and mucous membranes. Prolonged exposure to such dust can cause long-term personal health effects.

16.3. Specifications – 20" Powermatic Lathe

Working distance between centers ..... 31-1/2"
Working distance between centers, 18" bed extension mounted ..... 48"
Maximum distance between spindle face and tailstock quill ..... 36"
Swing over bed ..... 20"
Maximum overall length ..... 73"
Spindle speeds (RPM) ..... high 125-3200; low 50-1200
Spindle thread size ..... 1-1/4" x 8 TPI
Headstock spindle taper ..... #2 Morse
Tailstock quill taper ..... #2 Morse
Hole through tailstock spindle, diameter ..... 3/8"
Hole through headstock spindle, diameter ..... 5/8"
Tailstock quill travel ..... 4-1/2"
Spindle direction ..... forward/reverse
Tool support ..... 14"

16.4. Specifications – 14" Jet Mini Lathe

This ½ HP lathe supports stock up to 10" in diameter and 14" in length.

- Self-ejecting tailstock for safe and easy removal of tooling
- Hollow tailstock and removable tip on live center allows for hole boring through stock

Swing Over Bed ..... 10"
Swing Over Tool Rest Base ..... 7-1/2"
Distance Between Centers ..... 14"
Speeds (RPM) 500, 800, 1240, 1800, 2630, 3975
Headstock Taper MT-2
Spindle Nose ..... 1" x 8 TPI
Tailstock Taper MT-2
Hole through Tailstock ..... 3/8"
Ram Travel ..... 2"
Tool Rest ..... 6"

16.5. Setup & Use – 14" Jet Mini Lathe

16.5.1. Tailstock Movement

- Tailstock Handwheel (A, ***Figure 2***) – Turn clockwise to move tailstock spindle forward. Turn counterclockwise to retract tailstock spindle.
- Tailstock Spindle Lock (B, ***Figure 1***) – Locks tailstock spindle. Release to adjust with handwheel.
- Tailstock Lock (C, ***Figure 1***) – Locks tailstock in position on the bed. Release to move the tailstock assembly closer to or farther from the headstock.
- The tailstock spindle is hollow. This can be useful for inserting a long bit to drill a hole in the center of a workpiece on the face plate.

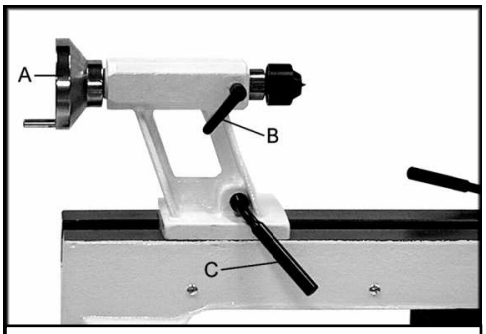


Figure 1. Tailstock Movement

16.5.2. On/Off Switch

(*Figure 2*) – Has a safety feature to prevent unauthorized use; pull out the upper piece of the switch and store in a safe place. The piece must be re-inserted to operate the lathe.

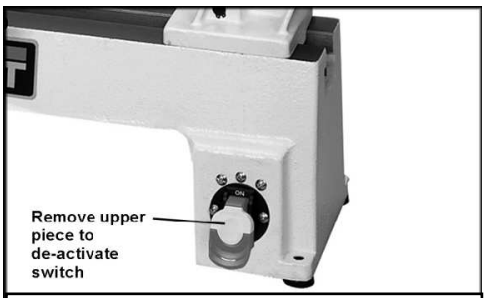


Figure 2. On/Off Switch

16.5.3. Spur Center

(*Figure 3*) – Slides into headstock and holds the workpiece during spindle turning.

WARNING: *Thoroughly clean the taper on the spur center and the inside of the headstock spindle before mounting the spur center. Failure to do so may result in separation of the two and possible injury or tool damage.*

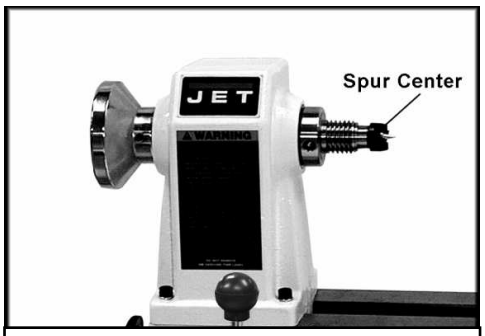


Figure 3. Spur Center

16.5.4. Face Plate

(*Figure 4*) – Screws on to the headstock and is used in face plate turning operations. Mount your workpiece onto the faceplate with brass screws (not provided).

- Make sure the screws are not so long that they will enter the area of the workpiece where the material is to be removed.
- To remove the face plate from the spindle, place the drift rod into hole (A, ***Figure 4***) and let the drift rod contact the bed of the lathe for leverage. Then unscrew the face plate.

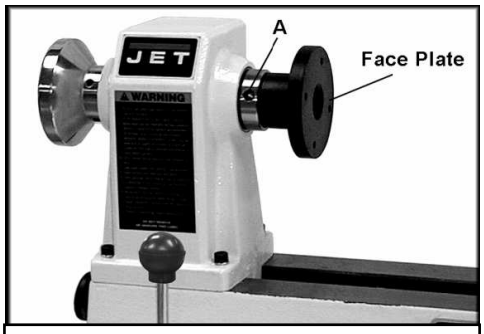


Figure 4. Face Plate

16.5.5. Drift Rod

(*Figure 5*) – Slides into the headstock to tap the spur center free. Stored in the hole in the base below the headstock.

NOTE: *Always hold on to the spur center while tapping it free, to prevent it from falling.*

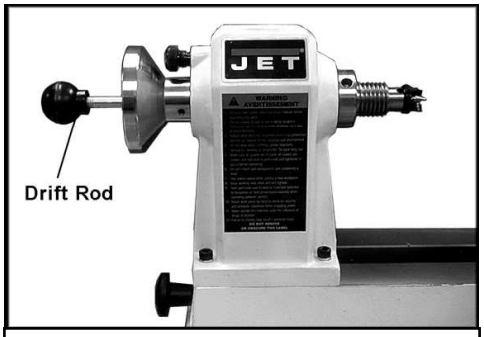


Figure 5. Drift Rod

16.5.6. Tool Rest

(*Figure 6*) – Attaches to the bed. Used to steady the cutting tool during spindle turning or face plate operations.

- Adjusting the Tool Rest Position the tool rest (***Figure 6***) as close to the workpiece as possible. It should be 1/8" above the centerline of the workpiece.
- Position the tool rest base on the bed by releasing the locking rod (A, ***Figure 6***) and sliding base to the desired position. Tighten locking rod to fix the position of the tool rest base.
- Adjust the height of the tool rest by loosening the handle (B, ***Figure 6***) and raising or lowering tool rest.
- Should adjustment of the tool rest clamping device become necessary, turn off the machine, reach under the bed, and adjust the clamping nut.

NOTE: *The lock handles (**B, Figure 1 & B, Figure 6** for example) are adjustable. Simply pull up on the handle, rotate it on the pin, and then release. Make sure the handle seats itself properly upon the pin.*

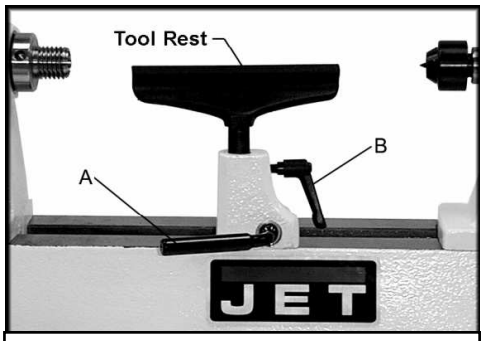


Figure 6. Tool Rest

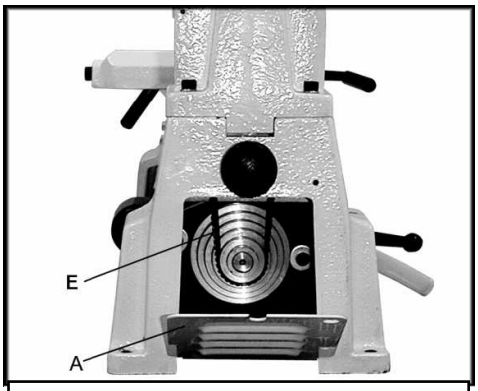


Figure 7. Changing Spindle Speeds

16.5.7. Changing Spindle Speeds

a. Disconnect the machine from the power source (unplug).

b. Open the access doors at the left side of the base (A, ***Figure 7***) and at the back side of the headstock (B, ***Figure 8***).

c. Loosen the motor plate lock handle (C, ***Figure 9***). Lift up the motor plate handle (D, ***Figure 9***) to take tension off the belt.

d. Move the belt (E, ***Figure 7***) to the desired pulley groove according to the speed chart found on the inside of the headstock access door. Be sure the belt is aligned with spindle pulley and motor pulley.

e. Tension the belt by pushing down on the motor plate handle (D, ***Figure 9***) and retighten lock handle (C, Figure 11)

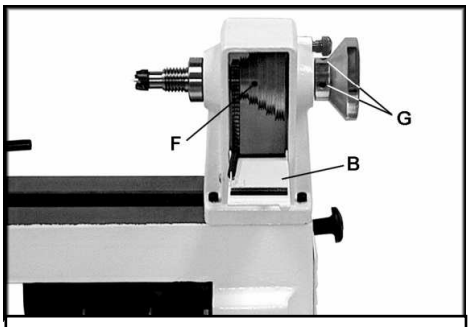


Figure 8. Changing Spindle Speeds

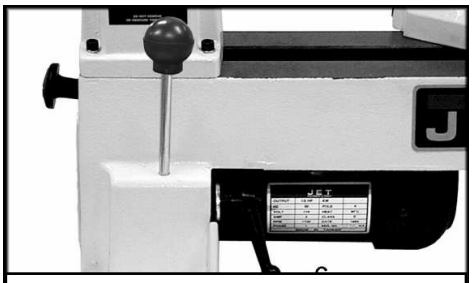


Figure 9. Changing Spindle Speeds

16.5.8. Removing & Installing Live Center

a. Loosen tailstock lock handle (B, ***Figure 10***).

b. Turn the tailstock handwheel (A, ***Figure 10***) counterclockwise until the live center (C, ***Figure 10***) ejects from the spindle.

NOTE: *Do not allow the live center to fall*.

c. Before installing the live center into the spindle, the spindle must be extended out from the tailstock body far enough to allow the live center to "seat" in the spindle.

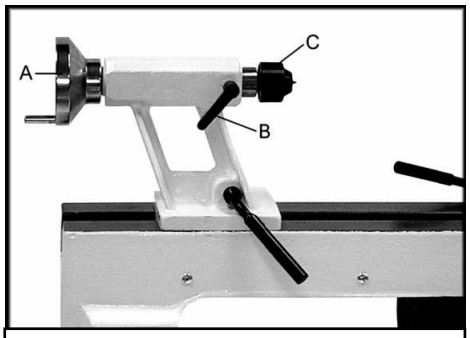


Figure 10. Remove/Install Live Center

16.6. Setup & Use – 20" Powermatic Lathe

16.6.1. Key, On/Off, Reverse, Speed Control

See the Shop Monitor for the key to the Powermatic; they will verify you are on the "Approved Users" list.

Controls are shown in ***Figure 11***:

A. **On/Off Button:** Push in to stop the machine; pull out to start the Lathe.

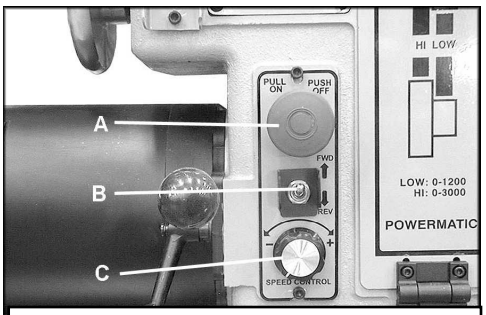


Figure 11. On/Off, Reverse, Speed Control

B. **Forward/Reverse Switch:** ***WARNING:*** *When turning with a face plate, make sure both set screws on the face plate are tight (see* ***Figure 19****) before reversing the spindle. Failure to comply may cause the face plate to spin loose from the spindle.*

C. **Speed Control Dial:** Always start the Lathe at the lowest speed, with the dial rotated all the way counter clockwise.

16.6.2. Headstock & Tailstock Movement

To slide the headstock or tailstock, swing the locking handle (A, ***Figure 12***) backward or forward until the headstock/tailstock can slide freely. When the headstock/tailstock is positioned, rotate the locking handle to tighten it securely.

To remove headstock, tailstock or toolrest base from the bed, unscrew and remove either of the stop bolts (B, ***Figure 12***). After re-mounting these items on the Lathe, re-insert the stop bolt. For most turning operations, except outboard turning, the headstock should be positioned at the left end of the bed, and only the tailstock moved to accommodate the workpiece.

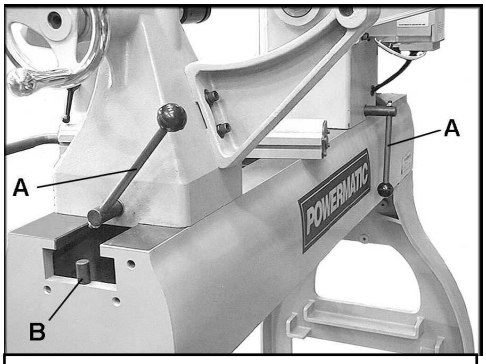


Figure 12. Headstock/Tailstock Movement

16.6.3. Tool Support

A 14" tool support is provided with your Lathe. It is designed to allow adjustment for height, position on the bed, and angle to the work.

Loosen the locking handle on the tool support base (C, ***Figure 13***) to slide the support base forward or back, and to angle it to the bed. Tighten the locking handle firmly before operating the Lathe.

Loosen the small handle (D, ***Figure 13***) to raise or lower the tool support and angle it to the work. Tighten the handle before operating the Lathe.

The small handle (D, ***Figure 13***) can be inserted into one of three holes on the tool support base. The position shown in ***Figure 13*** is preferred so that the locking handle contacts the groove in the tool rest shaft.

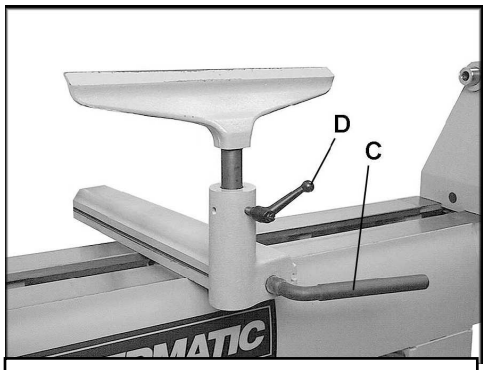


Figure 13. Tool Support & Locking Handles

16.6.4. Locking Handles

Each small locking handle such as D, ***Figure 13*** can be rotated to a more convenient position. Simply lift up on the handle, rotate it on the pin, then release it, making sure it seats itself on the pin.

16.6.5. Live Center & Cone

The live center cone, shown in ***Figure 14***, screws clockwise onto the threads of the live center body.

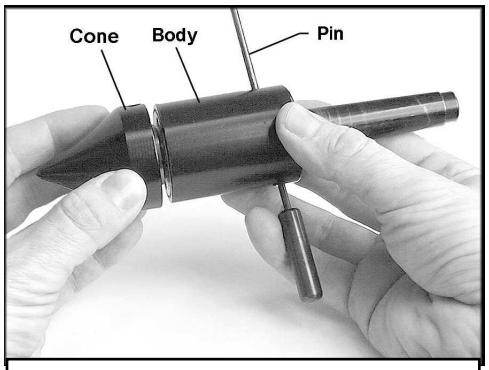


Figure 14. Live Center & Cone

To remove the cone from the live center, first insert the live center pin through the hole in the live center body as shown in ***Figure 14***. If the pin will not insert at first, rotate the cone until the pin can be inserted. The cone can now be removed by holding the body stationary while unscrewing the cone.

16.6.6. Indexer

The indexer allows you to cut evenly spaced features in a workpiece while keeping the Lathe headstock spindle locked; for example, when cutting flutes on a spindle blank with a router, while the spindle blank is secured within the Lathe centers.

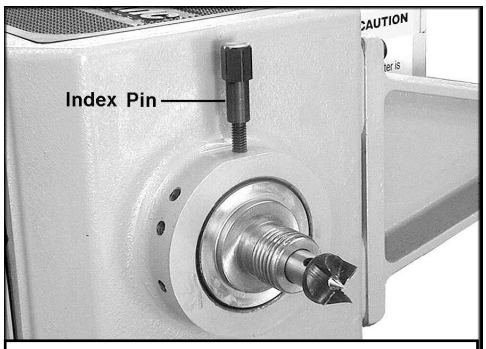


Figure 15. Indexer Pin

There are 12 holes in the spindle collar spaced 30° apart, and 4 holes in the headstock casting which accept the index pin (see ***Figures 15 & 16***). The combination of holes will allow you to mark your workpiece for evenly spaced features.

a. To use the indexer, thread the index pin (***Figure 15***) into one of the four holes until the index pin engages the spindle and prevents it from turning. This will be your first indexing position.

b. Unscrew and remove the index pin, and look down the hole, carefully counting the number of holes as you rotate the spindle using the handwheel. Continue to rotate the spindle until you reach the hole needed for your second flute cutting, then re-insert the index pin.

c. Refer to the more detailed instructions and chart in the Powermatic Manual (available at the Monitor's Desk) to determine in which holes to place the index pin relative to the number of flutes desired in your workpiece.

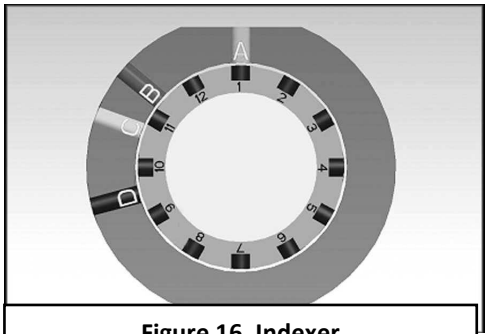


Figure 16. Indexer

NOTE: *Remove index pin before turning on the Lathe.*

16.6.7. Centers – Installing and Removing

a. Disconnect Lathe from power source.

b. To install a spur center or live center (the spur center should first be mounted to your workpiece; see under "Operation" for more details), clean the tapered end of the center and the inside of the headstock taper spindle, then push the center into the headstock spindle.

c. To remove a spur center or live center, first remove the workpiece from the Lathe. Insert the knockout rod (***Figure 17***) through the hole in the handwheel and firmly tap the tapered end of the spur center. The sliding collar on the knockout rod helps give the necessary impact without having to use a mallet against the end of the rod.

IMPORTANT: *Hold the center by either placing your thumb and forefinger on the outside diameter of the spur center, or wrapping the center with a rag. The center can be damaged if allowed to fall.*

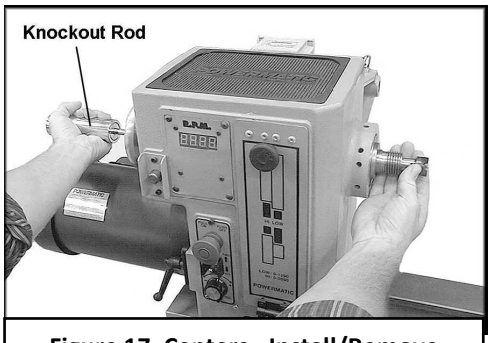


Figure 17. Centers - Install/Remove

16.6.8. Face Plate – Installing and Removing

a. Disconnect Lathe from power source.

b. Mount the face plate to your bowl blank.

c. Push in the spindle lock button (***Figure 18***) and rotate the handwheel slightly until the spindle locks. Keep the spindle lock button pushed in.

d. Install the face plate onto the threads of the headstock spindle and rotate clockwise hand-tight. When the Lathe is turned on (forward rotation), the rotational force will snug the face plate even further onto the threads.

WARNING: *If at any time you will be reversing spindle rotation, make sure the two set screws in the face plate are tight! One of these is shown in* ***Figure 19****. Failure to do this may cause the face plate to loosen from the headstock spindle.*

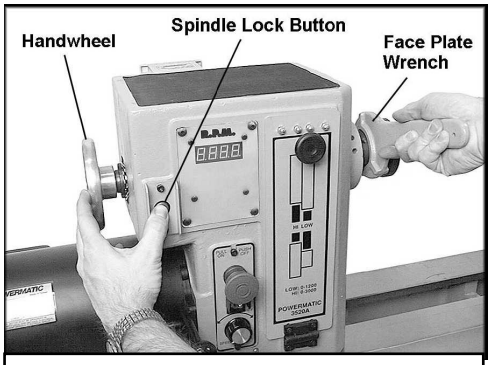


Figure 18. Faceplate - Install/Remove

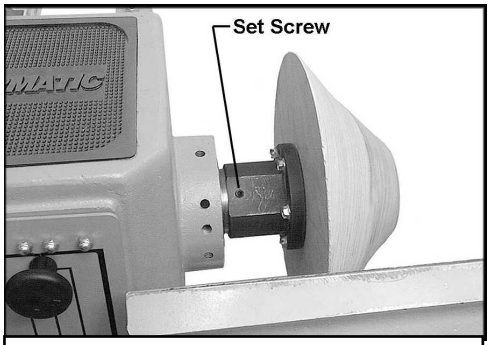


Figure 19. Faceplate - Install/Remove

e. To remove the face plate, loosen the two socket set screws (***Figure 19***). Engage the spindle lock button and turn the face plate counterclockwise with the face plate wrench, as shown in ***Figure 18***.

16.6.9. Comparator – Installing and Using

The spindle comparator consists of two comparator centers inserted into the brackets at the back of the Lathe. The comparator is used to mount a finished, or "reference spindle" from which measurements can be taken, the measurements being transferred to the new piece which is being turned.

WARNING: *The guard must be removed to use the spindle comparator. Use caution and wear a face mask when turning without the guard installed.*

a. Remove the guard from the headstock bracket.

b. Install the comparator spur center into the headstock bracket, by lifting up on the spring pin and inserting the comparator spur center until its point is about even with the point of the spur center in the headstock spindle. See ***Figure 20***. The spring pin in the bracket should engage one of the holes in the comparator center at this position.

c. Install the rear comparator center in the tailstock bracket and tighten the bracket handle. See ***Figure 21***.

d. Mount the spur center with the spindle blank that you will be turning. Loosen the tailstock locking handle, and slide the tailstock until the live center is about 1-inch from the spindle blank, then tighten the locking handle. Advance the live center using the tailstock handwheel, until the live center is secured in the spindle blank.

e. Mount the reference spindle between the comparator centers, as shown in ***Figure 21***.

NOTE: *The reference spindle should be mounted last after all adjustment of the tailstock and ram has been accomplished with the spindle blank. Likewise, when turning operation is complete, remove the reference spindle first.*

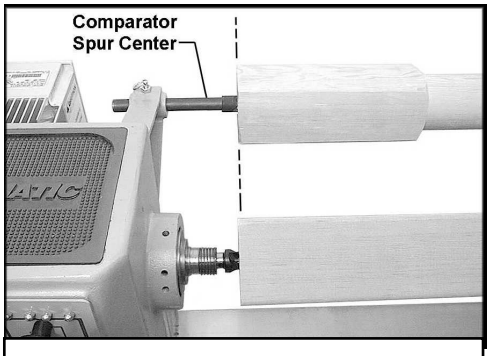


Figure 20. Comparator – Install & Use

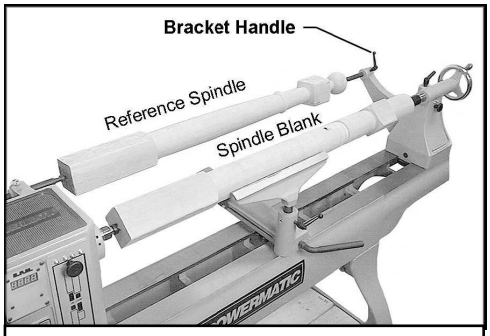


Figure 21. Comparator – Install & Use
(shown with optional 18" bed extension)

16.6.10. Speed Change

a. Disconnect Lathe from power source.

b. To change speed ranges, pull open the access door on the headstock.

c. Loosen the pivot lock handle (A, ***Figure 22***) and lift up the tension handle (B, ***Figure 22***) to raise the motor. Tighten the pivot lock handle (A, ***Figure 22***) to hold the motor in the raised position. 4. There should be sufficient slack in the belt to reposition it to the other steps on the sheaves. The label on the access door shows the required belt position.

d. Loosen the pivot lock handle (A, ***Figure 22***) and lower the motor to tension the belt. Be sure that the Poly-V grooves of the belt seat properly in the corresponding groove of the sheave. Do not overtension; a very light pressure on the tension handle (B, ***Figure 25***) is adequate to prevent belt slippage.

e. Tighten the pivot lock handle (A, ***Figure 22***).

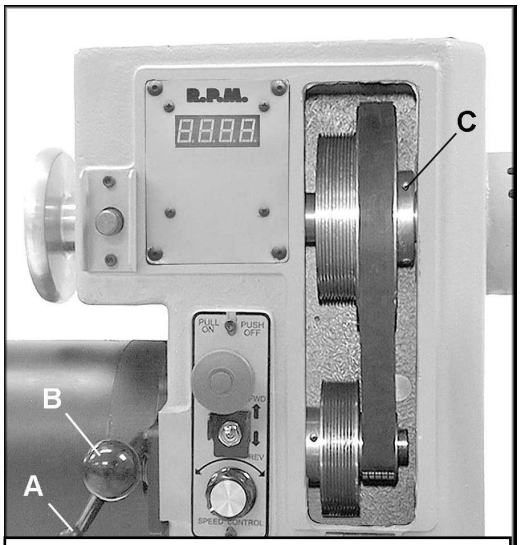


Figure 22. Speed Change
(Belt shown in LOW speed range position)

17. MORTISER, HOLLOW CHISEL (Powermatic 719A)

(NOTE: Portions of the information presented in this section were taken from the Powermatic Operating Manual.)

A mortiser is used to cut square or rectangular holes in a piece of lumber, such as a mortise in a mortise and tenon joint. A drill bit clears out most of the material to be removed and a chisel ensures the edges are straight and clean.

17.1. Safety Precautions

a. DO NOT force the tool.

b. MAKE SURE that power to the machine is turned off and the motor is not turning prior to making adjustments.

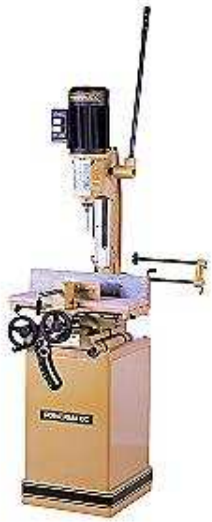
c. CHECK FOR DAMAGE to machine parts and bits prior to operations.

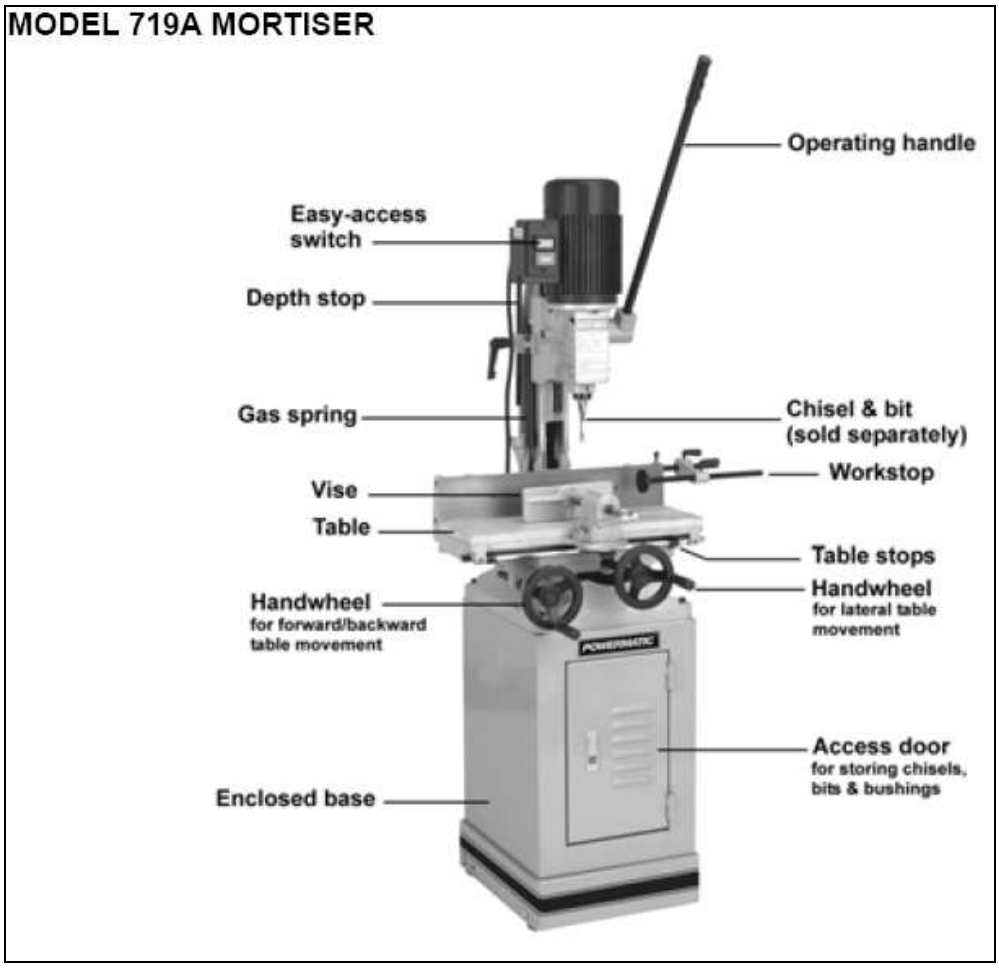
d. NEVER leave tool running unattended.

e. DO NOT overreach. Keep your proper footing and balance at all times.

f. MAKE SURE bit is chucked and properly rotated prior to operation.

g. DO NOT use the chisel if it is smoking in the cut.





17.2. Set Up & Use – Hollow Chisel Mortiser

17.2.1. Installing a Chisel & Bit

a. Loosen lock screw, shown in ***Figure 1***.

b. Insert chisel bushing (with the hole facing forward) into the head. Tighten the screw just enough to hold the chisel in place.

NOTE: Set the slot in the side of the chisel to the left or right, NOT to the front or back. This will allow chips to escape when cutting mortises.

c. Push the chisel up as far as possible into the head. Then lower the chisel approximately 1/16" to 3/16", depending on the type of wood being worked. Tighten the screw to hold chisel in place.

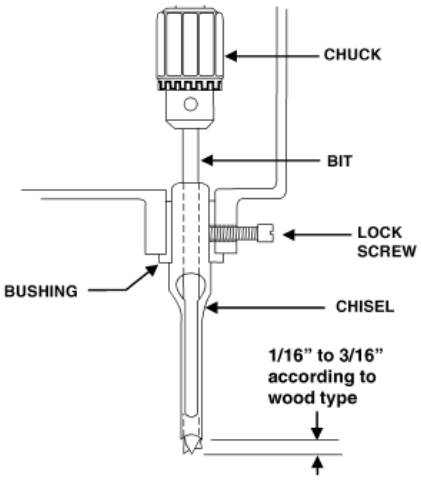


Figure 1

d. Push bit up through the chisel opening as far as it will go. Lock the drill bit in place with the chuck key.

e. Loosen screw and push chisel up against the bushing, then tighten screw. This should provide the proper distance between the points of the chisel and the bit.

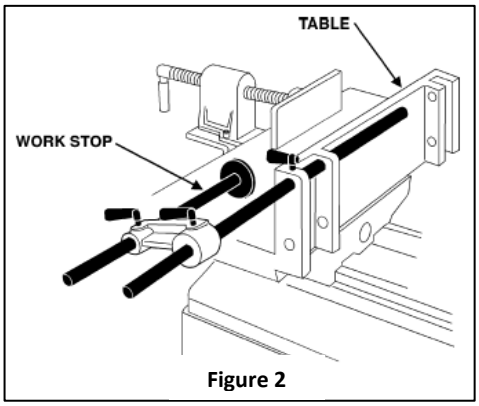


Figure 2

17.2.2. Work Stop

The work stop can be mounted to either end of the table through the holes in the back of the table, as shown in ***Figure 2***. It is tightened into place by means of thumb screws.

17.2.3. Through Mortise Cuts

When performing "through" mortises, and probably for all cuts, a piece of wood (slightly narrower than project) should be placed under workpiece. **Make sure vice is tight enough to keep project in place when withdrawing chisel.**

To set the depth:

- mark the distance on the work
- bring the chisel down to the desired depth
- release the lock nut (letting the stop fall to the desired depth)
- then tighten the lock

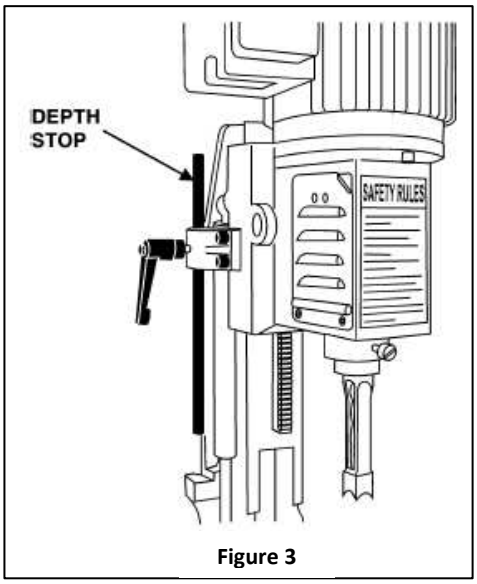


Figure 3

17.2.4. Operation

a. Set depth stop to the required depth of cut. (see ***Figure 3***)

b. Place workpiece on table and clamp it with the vise. Use the left handwheel to move table forward or backward to suit the position of the mortise on the workpiece. Care must be taken to ensure that the chisel is "square" with the fence and the workpiece.

NOTE: *It is a good idea to always mark one side of each piece so that when placing the project into the vice the "same" side is facing out. By the same token, never "flip" your pieces, move them along the vice so that the same side is out.*

c. Adjust the table stops, ***Figure 4***, according to the length of cut required, then tighten the thumb screws.

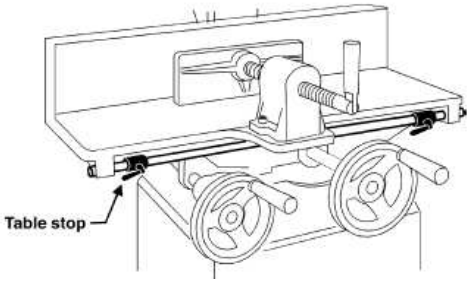


Figure 4

d. Turn on machine and feed chisel and bit steadily into workpiece by pulling down the operating handle.

NOTE: *The rate of feed must be fast enough to prevent burning at the tip of the bit, but not so fast as to cause the machine to slow or stall. The different rates of feed for different woods must be learned through experience.*

e. After the first cut, the workpiece is moved along with the right handwheel for each successive cut. The direction of movement must allow the chips to clear freely. Move the workpiece so that the slot in the chisel is releasing chips into the already cut part of the workpiece. See ***Figure 5***.

When cutting deep mortises, make the cut in several stages of approximately 1" each to allow chips to clear. To prevent breakout at the back of the workpiece when cutting through mortises, use a piece of scrap material under the workpiece as support.

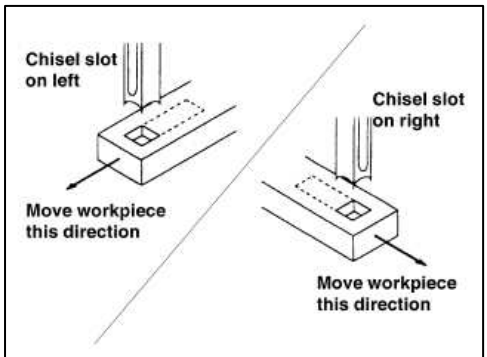


Figure 5

NOTE: *The first two cuts must be on the opposite ends of the mortise to ensure that the bit is remaining perpendicular to the work. The first two cuts should be made in a series of up-down motions to relieve pressure on the bit. The rest of the cuts are made using only 1/2 the chisel.*

CAUTION: Do not have the chisel slot against the blind end of the mortise, as the chips will not be able to clear the chisel. This can cause overheating and possible breakage of chisel or bit.

18. NAILER, BRAD – PNEUMATIC (Porter-Cable BN200A)

(NOTE: Portions of the information presented in this section were taken from the Porter-Cable Operating Manual.)

A heavy duty pneumatic brad nailer is designed to install 18 gauge brad nails of various lengths (from 5/8” to 2" long).

There are two of this model nailer in the Woodshop.

18.1. Safety Precautions

a. **KEEP tool pointed away from yourself and others at all times.**

b. DISCONNECT the tool from air supply before clearing jams, performing repairs, and during non-operations.

c. DO NOT keep the trigger pulled on safety yoke mechanism when carrying or holding the tool.

d. NEVER carry the tool by the hose or pull the hose to move the tool.

e. MAKE SURE the air hose is free of obstructions or snags. Entangled or snarled hoses can cause loss of balance or footing and also may become damaged.

f. POSITION FINGER no closer to nail than length of nail being driven because the nail may follow the grain of the wood, causing it to protrude unexpectedly from the side of the work material.

g. NEVER leave a tool unattended with the air hose attached.

h. ALWAYS assume that the tool contains fasteners.

i. DO NOT drive fasteners close to the edge of the workpiece as: the wood may split, allowing the fastener to be deflected possibly causing injury, or the workpiece may split causing the fastener to ricochet, injuring you or a co-worker.

j. DO NOT drive fasteners on top of other fasteners or with the tool at an overly steep angle as this may cause deflection of fasteners which could cause injury.

k. DURING normal use the tool will recoil immediately after driving a fastener. This is a normal function of the tool. Do not attempt to prevent the recoil by holding the nailer against the work. Restriction to the recoil can result in a second fastener being driven from the nailer. Grip the handle firmly and let the tool do the work. Failure to heed this warning can result in serious personal injury.

18.2. Setup & Use – Pneumatic Air/Oil

Pneumatic tools need to receive a continuous supply of oil as well as air. In the Woodshop, that supply comes by routing the compressed air coming from the compressor through the black automatic oiler shown in this picture.

The blue device in this picture regulates the air pressure and it needs to be checked to make sure the pressure is set between 85-90 PSI before connecting the tool. There are several such setups in the Woodshop.

The picture shows the pressurized air and automatic oiler system located by the sanding table.

18.3. Setup & Use – Brad Nailer

18.3.1. Preparing the Tool

a. Connect the tool to the air supply (see ***Figure 1)***.

b. Depress latch and slide magazine cover open (see ***Figure 2)***.

c. Insert a strip of approved fasteners (see ***Figure 3)***. Orient fasteners with points down, and in contact with the bottom of the magazine.

d. Push magazine cover closed (see ***Figure 4)***.

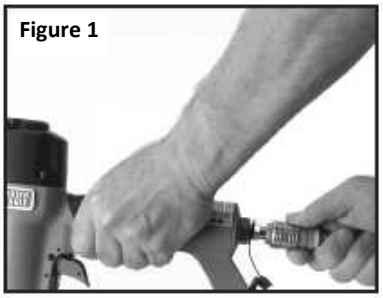


Figure 1

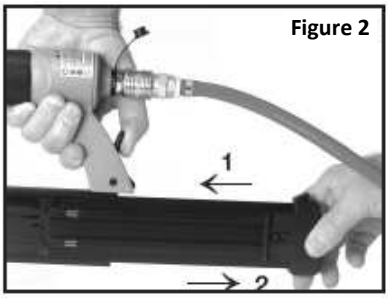


Figure 2

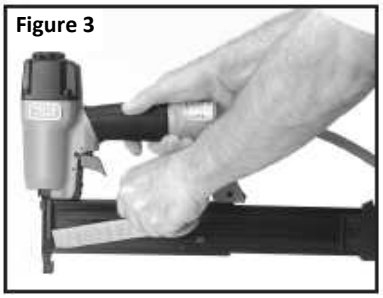


Figure 3

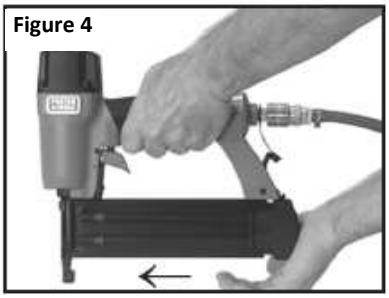


Figure 4

e. Adjust the directional exhaust deflector (A), ***Figure 5***, so that the exhaust air blast will be directed away from the operator. Grasp the deflector and rotate it to the desired position for the current application.

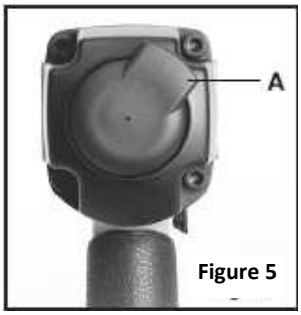


Figure 5

f. NOSE CUSHION: This tool is equipped with a rubber nose cushion (A), ***Figure 6***, that prevents marring of finished surfaces by the metal safety during normal operation. The nose cushion can be removed and stored in the rear area of the magazine (B) **Figure 6**, when it is not required. **CAUTION: Disconnect tool from air supply before removing or reinstalling rubber nose cushion.**

18.3.2. Using the Tool

To fire, grip tool firmly, position nose of tool onto work surface, push forward on tool to depress safety, and squeeze trigger to fire a fastener.

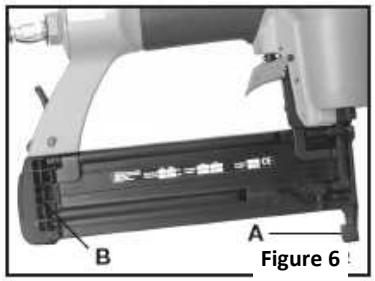


Figure 6

- Before pressing the trigger, make sure your free hand is positioned out of the way of a potential path of a nail in case of deflection. Besides damaging your workpiece, deflection can cause injury if your free hand is securing the workpiece in the location that the nail deflects. *(Deflection is caused when the nail changes its path, resulting in the nail puncturing the surface of the workpiece as shown in **Figure 7** – just picture a nail in place of the staple!)*

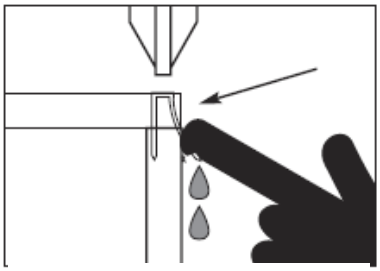


Figure 7: Example of staple or nail deflection

The **depth** to which a fastener is driven is controlled by the depth adjustment knob (A) ***Figure 8***:

- The depth of drive is factory adjusted to a nominal setting. Test fire a fastener and check depth. If a change is desired, rotate the adjustment knob (A) shown in ***Figure 8***. The adjustment knob has detents every 1/4 turn; rotate the knob clockwise to increase the depth of drive, rotate the knob counterclockwise to decrease the depth of drive.

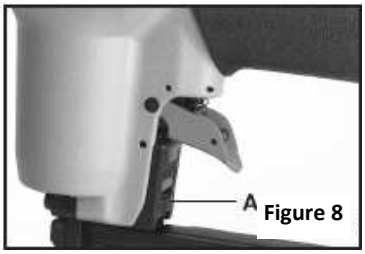


Figure 8

- Test fire another fastener and check depth. Repeat as necessary to achieve desired results. The amount of air pressure required will vary depending on the size of the fastener and the material being fastened. Experiment with the air pressure setting to determine the lowest setting that will consistently perform the job at hand, and never use an air pressure setting higher than 90 PSI. Air pressure in excess of that required can cause premature wear and/or damage to the tool.

18.3.3. Clearing a Jammed Fastener

a. **CAUTION: Disconnect tool from air supply.**

b. Open magazine and remove any remaining fasteners. **CAUTION: Remove fasteners from tool before opening the fastener guide plate. Fasteners are under pressure and may shoot out of magazine which could cause injury.**

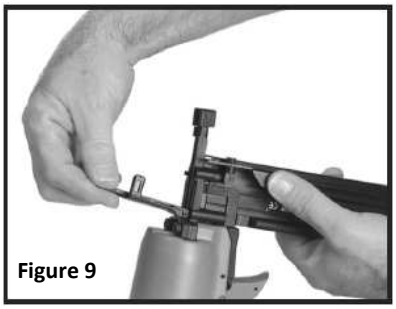


Figure 9

c. Depress the quick release latch and open the fastener guide plate (see ***Figure 9***).

d. Remove the jammed fastener (see ***Figure 10***).

e. Depress the quick release latch, close the fastener guide plate, and release the latch.

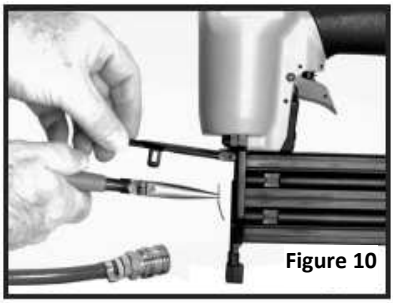


Figure 10

19. ROUTER, PLUNGE (Porter-Cable 6931, Porter-Cable 1001)

(NOTE: Portions of the information presented in this section were taken from the Porter-Cable Operating Manual.)

Routers are typically used to cut grooves, hollow out larger areas and create decorative trims along the edge of a piece of wood.

We have several routers in the Woodshop, but the principles of operation are generally the same for each model.

19.1. Safety Precautions

a. LARGE DIAMETER BITS are for use only in a router table. Using bits over 1" diameter in a handheld router can easily cause you to lose control of the tool.

b. INSPECT router bits for damage prior to use.

c. NEVER touch router bits after use, as they may be extremely hot.

d. MAKE all adjustments with the router power switch in the OFF position, bit stopped and router unplugged.

e. NEVER start the router with the bit in contact with the stock.

f. MAKE SURE that the switch is in the OFF position before plugging the unit in.

g. HOLD the router securely when turning the motor on. The high starting torque will cause the router to twist when it is turned on.

h. WAIT until the router spindle stops rotating before putting it down on the work surface.

i. ALL BITS in the Woodshop will require three to five passes dependent upon the type and size of the bit. Lower the bit on the router in 1/8” increments prior to each pass.

j. KEEP electrical cord away from the bit.

k. KEEP your hands on both handles and feed the cutter at an even rate of speed.

l. AT COMPLETION OF AN OPERATION: turn the machine away from you, turn it OFF, let it come to a complete stop, and place it on its side.

19.2. Setup & Use – Plunge Router

CAUTION: Before connecting router to power source, ALWAYS MAKE SURE SWITCH IS IN THE "OFF" POSITION.

19.2.1. Selecting the Bit

Routers are furnished with 1/4" and 1/2" diameter collets that will accommodate bits with 1/4" or 1/2" diameter shanks that are installed directly into the power unit collet.

19.2.2. Installing & Removing the Bit

CAUTION: DISCONNECT TOOL FROM POWER SOURCE.

a. Remove motor unit from base unit as follows:

- Loosen clamp screw (A) ***Figure 1***.
- While holding base, turn motor unit COUNTERCLOCKWISE until lower pin (B) in motor housing is disengaged from groove in base.
- Lift motor unit free from base unit.

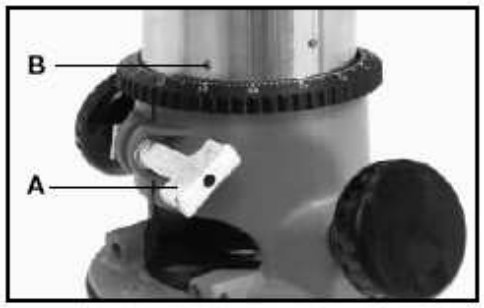


Fig. 1

b. Clean and insert shank of bit into collet until shank bottoms. Then back it out approximately 3/8" to 1/2".

c. Lay motor unit on its side on bench with the collet pointing AWAY from you.

d. Place one wrench on flats on chuck with the opposite end of the wrench resting on the bench to your left, ***Figure 2***.

e. Place other wrench on collet and tighten COUNTERCLOCKWISE as shown in ***Figure 2***. TIGHTEN FIRMLY.

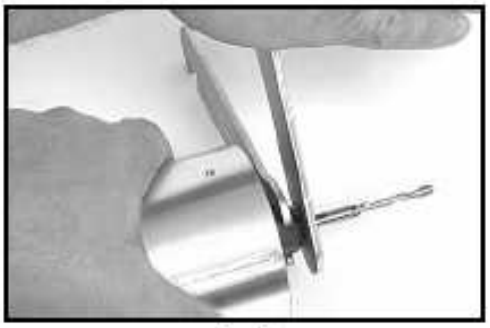


Fig. 2

AVOID POSSIBLE DAMAGE TO COLLET. NEVER TIGHTEN COLLET WITHOUT BIT.

f. To remove the bit, reverse the foregoing procedure.

19.2.3. Assembling the Motor in the Router Base

CAUTION: DISCONNECT TOOL FROM POWER SOURCE.

a. Loosen the clamp screw (A) ***Figure 1*** to allow the power unit to be set in the base unit.

b. Insert motor unit into base aligning lower pin (B) with groove in base.

c. Rotate motor unit CLOCKWISE into base until upper guide pins are rigidly set in the groove of the base.

d. Tighten clamp screw firmly.

19.2.4. Adjusting Depth of Cut

CAUTION: DISCONNECT TOOL FROM POWER SOURCE.

a. Loosen clamp screw (A), ***Figure 3***.

b. While holding base (E), turn motor unit (F), ***Figure 3***, COUNTERCLOCKWISE until the tip of the bit is above bottom surface of base.

c. Set router on flat wood surface.

d. Turn motor unit (F), ***Figure 3***, CLOCKWISE until bit touches the wood surface.

e. Tighten clamp screw (A), ***Figure 3***.

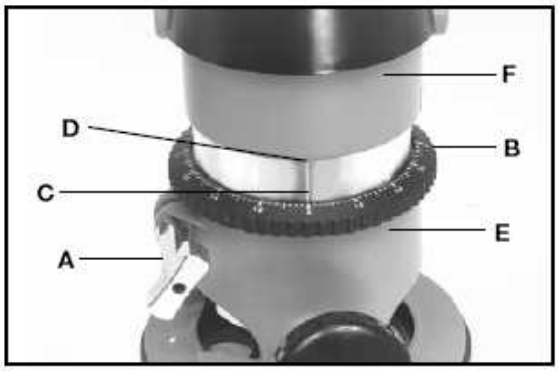


Fig. 3

f. Rotate depth adjusting ring (B), ***Figure 3***, until the zero-line (C) is opposite the index line (D) on the housing.

g. Loosen clamp screw (A), ***Figure 3***.

h. Tip the router so bit is clear of the wood surface. Turn motor unit (F), ***Figure 3*** CLOCKWISE until the index line (D) on the motor housing reaches the desired depth indicated on the ring.

i. Tighten clamp screw (A), ***Figure 3*** firmly.

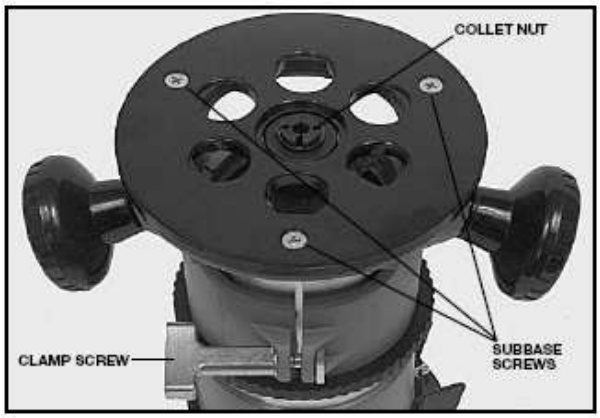


Fig. 4

NOTE: Setting the index line to 1/4" on the ring means the cutting edge of the bit is exposed 1/4" below the base.

19.2.5. Adjusting Sub-base Alignment

Applications using a template guide require the bit to be centered within the guide. This, in turn, requires the center hole in the sub-base to be in line with the collet of the motor unit. Your model has an adjustable sub-base which has been aligned at the factory. If the sub-base has been removed and/or readjustment is required, proceed as follows:

CAUTION: Be sure power switch is in "OFF" position and tool is disconnected from power source to avoid accidental starting of motor which could result in personal injury.

a. Loosen sub-base mounting screws just enough to allow sub-base to move on base.

b. Loosen clamp screw (see ***Figure 4***), and adjust motor so that the collet nut engages the center hole in the sub-base. Allow the sub-base to center itself on the collet nut. Tighten clamp screw.

c. Tighten sub-base mounting screws securely

19.2.6. Installing Motor in Plunge Base

CAUTION: DISCONNECT TOOL FROM POWER SOURCE.

a. Support clamp (see ***Figure 5***) and loosen motor clamp screw approximately 1/2", with Allen wrench (furnished).

b. Insert motor unit into base with switch positioned at front of left handle (see rear view in ***Figure 6***), and align the four pins (A) ***Figure 6***, in the motor case with the slots (B) ***Figure 6***, in the base.

Fig. 5

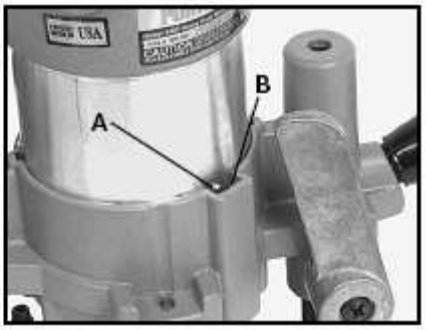


Fig. 6

c. Seat motor in base and tighten clamp screw to secure.

19.2.7. Removing Motor from Plunge Base

CAUTION: DISCONNECT TOOL FROM POWER SOURCE

a. Remove clamp screw, flat washer, lock washer, and clamp locking nut.

b. Insert Allen wrench (A) ***Figure 7***, as shown, to contact locking plate. Tap lightly to release and remove locking plate.

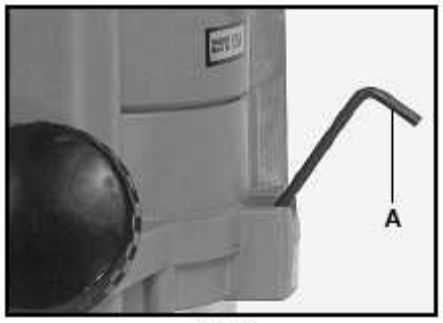


Fig. 7

c. Slide motor out of base.

d. Reassemble clamp screw, lock washer, flat washer, locking plate and clamp locking nut to base and tighten lightly to prevent loss.

19.2.8. Installing & Removing the Bit

CAUTION: Be sure power switch is in the OFF position and tool is disconnected from power source to avoid accidental starting of motor which could result in personal injury.

a. Stand router upside down on its motor cap (see ***Figure 8***).

Fig. 8

b. Clean and insert shank of bit into collet until shank bottoms. Then back it out approximately 3/8" to 1/2".

c. Place one wrench on flats on chuck and one wrench on collet nut (see ***Figure 8***). Tighten firmly.

DO NOT *ALLOW WRENCHES TO CONTACT COLUMNS (A)* ***Figure*** *9, AS COLUMNS MAY BE DAMAGED, RESTRICTING PLUNGE ACTION.*

NEVER *TIGHTEN COLLET NUT WITHOUT BIT INSERTED. TO DO SO MAY DAMAGE COLLET.*

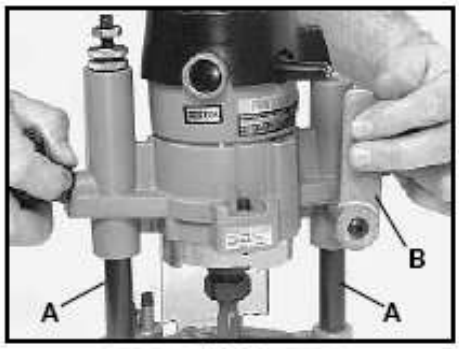


Fig. 9

d. To remove bit, reverse the foregoing procedure. If bit does not remove easily, tap the collet nut with wrench to release bit.

19.2.9. Adjusting Plunge Base

CAUTION: DISCONNECT TOOL FROM POWER SOURCE

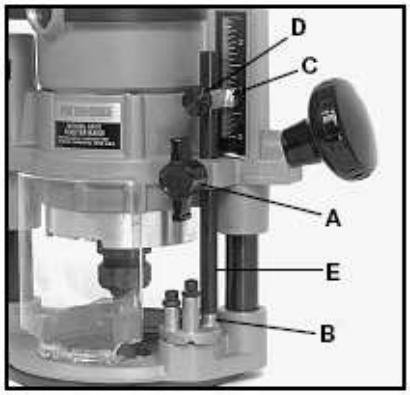


Fig. 10

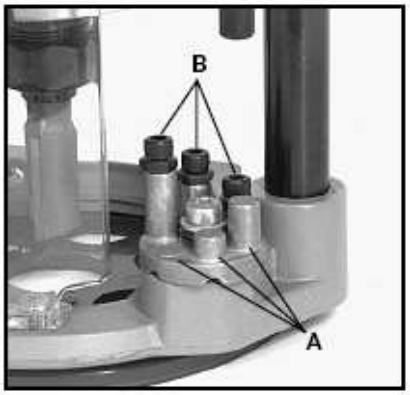


Fig. 11

a. Loosen depth rod locking knob (A) ***Figure 10***, and depth indicator knob (D) ***Figure 10***, allowing the depth rod (E) ***Figure 10***, to contact one of the turret stops (B) ***Figure 10***.

Normally the deepest desired cut is set with the depth rod resting on the shortest turret stop (A) ***Figure 11***. The other two fixed stops then provide reduced cutting depths of 1/4" and 1/2" respectively. The three adjustable stops may be adjusted to any desired height. Any combination of fixed and/or adjustable stops may be utilized to achieve the desired depths required for a particular job.

b. Release plunge mechanism by pulling the locking lever (B) ***Figure 9***, to the left and lower plunge mechanism until the router bit just touches the work surface. Release lever and push to the right to lock mechanism in this position.

c. Tighten depth rod locking knob.

d. Position depth indicator (C) ***Figure 10***, at "0" position and tighten knob.

e. Loosen depth rod locking knob and raise depth rod until indicator aligns with the graduation representing the desired depth of plunge. (The example in ***Figure 12*** shows setting for 1" plunge.)

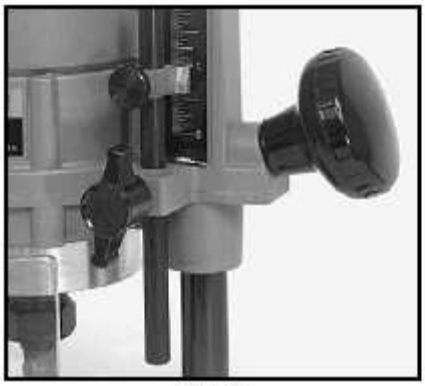


Fig. 12

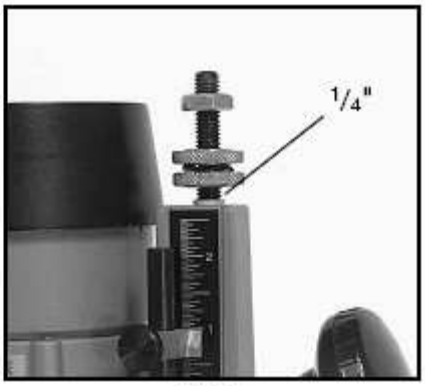


Fig. 13

f. Turn lower travel limiting nut until it is approximately 1/4" above the top of the plunge housing (see ***Figure 13***). While holding lower nut, turn upper nut until it "jambs" against the lower nut.

CAUTION: *The travel limiting nuts must always be "jammed" together to prevent movement (caused by vibration) which could prevent full bit retraction.*

CAUTION: *The travel limiting nuts must always be set so that bit can be retracted into base of router, clear of work.*

DO NOT *attempt to increase plunge travel by readjusting the stop nut. Increasing the travel beyond 2-1/2" can cause mechanism to jam.*

19.2.10. Starting & Stopping the Motor

CAUTION: Before starting the router make sure bit is clear of workpiece and foreign objects. Also keep firm grip on router to resist starting torque.

The motor is started and stopped by setting the toggle switch (A) ***Figure 14*** to "ON" or "OFF" position.

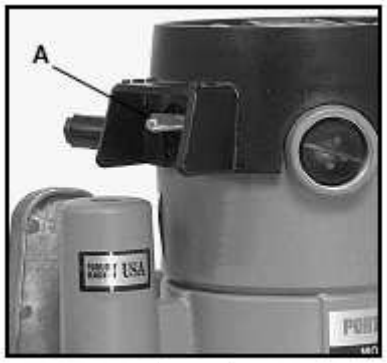


Fig. 14

CAUTION: *To avoid personal injury or damage to finished work always allow the motor to come to a COMPLETE STOP before setting it down.*

CAUTION: *When through-cutting, be sure there is clearance under workpiece for router bit.*

19.2.11. Using the Router

CAUTION: Always be sure the work is rigidly clamped or otherwise secured before making a cut.

Before using your router, consider the kind and total amount of material to be removed. Depending on the material, it may be necessary to make more than one cut to avoid overloading the motor. Before beginning the cut on the actual workpiece, it is advisable to make a sample cut on a piece of scrap lumber. This will show exactly how the cut will look as well as enable you to check dimensions.

Generally speaking, when working on a bench, the workpiece should be held on the bench by wood clamps. When routing edges, the router must be held firmly down and against the work by both guiding knobs.

Since the **cutter rotates clockwise** (when viewing router from top), the router should be moved from left to right (counter-clockwise) as you stand facing the work. Always route any end grain first.

- When working on the inside of a template, move router in clockwise direction (***Figure 15***).
- When working on the outside of a template, move router in a counter clockwise direction (***Figure 15***).

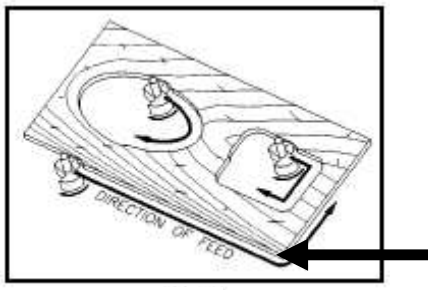


Fig. 15

WARNING: *Avoid "Climb-Cutting" (cutting in direction opposite that shown in* ***Figure 15****), "Climb-Cutting" increases the chance for loss of control resulting in possible personal injury. When "Climb-Cutting" is required (backing around a corner), exercise extreme caution to maintain control of router.*

The speed and depth of cut will depend largely on the type of material being worked upon. Keep the cutting pressure constant but do not crowd the router so the motor speed slows excessively. It may be necessary on exceptionally hard woods or problem materials to make more than one pass at various settings to get the desired depth of cut.

When making cuts on all four edges of the workpiece, it is advisable to have the first cut on the end of the piece across the grain. Thus, if chipping of wood occurs at the end of a cut, it will be removed when making the next cut parallel with the grain.

Periodically wipe columns clean with a dry cloth. DO NOT lubricate columns.

19.2.12. Edge Guide

An edge guide is available as an accessory to aid in routing operations such as: straight edge planing, parallel grooving, dado or slotting operations.

To assemble, insert guide rods (A) in holes in base, ***Figure 16***, and secure with screws (B). The guide (C) is adjusted on the rods and secured in desired position with thumb screws (D).

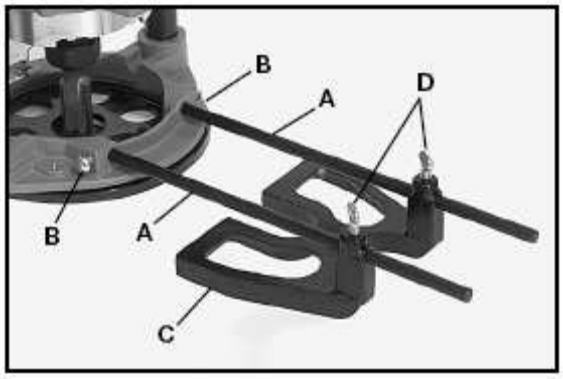


Fig. 16

19.2.13. Template Guides

CAUTION: DISCONNECT TOOL FROM POWER SOURCE.

A wide variety of template guides are available for use in pattern and template routing operations, ***Figure 17*** shows a typical combination bit, template guide, and locknut.

To install, insert template guide in center hole in router base and secure in place with the locknut.

BEFORE CONNECTING ROUTER TO POWER SOURCE: Install bit, adjust depth of cut, and rotate router chuck by hand to be sure bit or collet does not contact template guide.

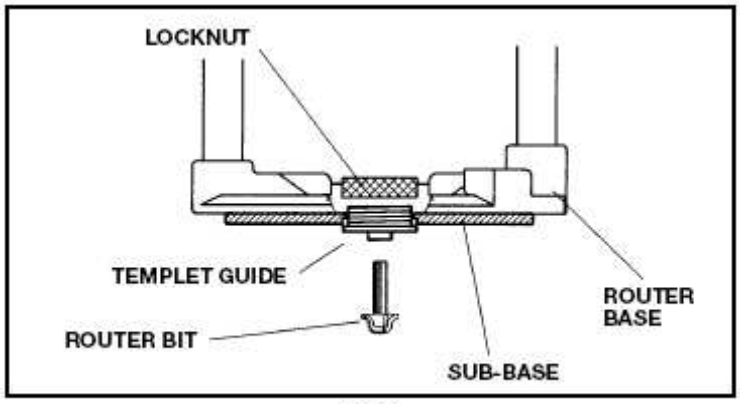


Fig. 17

20. ROUTER, TABLE (Rockler JessEm Route-R-Lift Table) & (Clincher Fence Machine Table with Jointech Smartfence Plus CL-18)

The router inside the *Rockler JessEm Route-R-Lift Table & Fence* system has a more powerful motor. Use this router for large bits to ensure you do not burn up the router motor. It has a basic movable fence.

The router with the *Clincher Fence Machine Table with Jointech Smartfence Plus CL-18* has a smaller motor, but has a precision adjustable fence system. This router uses the same type lift table.

A third router table, also with the *Clincher Fence Machine Table with Jointech Smartfence Plus CL-18 is identical to its lookalike.*

20.1. Safety Precautions

a. INSPECT router bits for damage prior to use.

b. LARGER BITS run at slower speeds and require more HP.

c. NEVER touch router bits after use, as they may be extremely hot.

d. MAKE all adjustments with the router power switch in the OFF position, bit stopped and router unplugged.

e. DO NOT bottom out the bit in the collet or partially insert the bit. Instead, completely insert the bit, then back off approximately 3/8" to 1/2" and tighten collar securely.

f. NEVER start the router with the bit in contact with the stock.

g. KEEP workpiece against the fence or bit collar during cutting operation.

h. USE FEATHERBOARDS to support the workpiece against the router table.

i. DO NOT force workpiece into router bit.

j. KEEP hands and fingers 2" from bit.

k. ALWAYS feed material from the right side of the bit to the left side of the bit for cutting the outside edge of a workpiece.

l. ALL BITS in the Woodshop will require three to five passes dependent upon the type and size of the bit. Raise bit in 1/8" increments.

m. TAKE LIGHT CUTS. Heavy cuts invite kickback. If necessary, move the fence closer to the bit or switch to a larger guide bearing.

n. AVOID SHAPING SMALL STOCK: Instead, shape a larger piece and reduce it in size afterwards. If you must shape a small piece, build an appropriate jig or secure the work within the jaws of a wooden hand screw clamp.

20.2. Set-Up & Use – Router Table

20.2.1. Rockler JessEm Route-R-Lift Table

- ADJUSTING ROUTER/BIT HEIGHT: Use handle to raise and lower router bit to desired level. The height change per revolution is labeled on each of our routers.

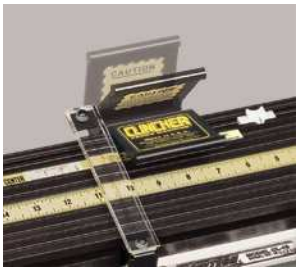
- CHANGING BITS: Use handle to raise router enough to get the two wrenches on the shaft to loosen the collet and change bits. ***CAUTION: Please do not jam the router to the very top of the mechanism; this can cause the mechanism to jam and will require the Maintenance Team to repair it.***

- Adjusting Fence: most uses of the fence are to hold the wood some small distance away from the router bit. There is a knob on the back of each end of the fence to secure the setting you desire.

20.2.2. Clincher Fence Machine with Jointech Smartfence Plus CL-18 fence.

The basic router and table work the same as the above system. The difference is in the fence, discussed below:

- MICRO-ADJUSTMENT THUMBWHEEL has detented Micro Adjustments every .001". It is especially useful when making dadoes and other cuts requiring high precision fence settings. Its bi-directional scale sleeve is adjustable for zeroing. Because of the detents, you don't even have to look at its scale to know how many thousandths of an inch you have moved the fence.



- 3 POSITION CLINCHER'S CAM-HANDLE makes positioning fast and accurate. In the vertical position, the carriage freely moves toward and away from your cutter. In the middle position, brass indexer engages leadscrew allowing for micro-adjustments of fence. Horizontal position locks Clincher securely into place.

20.3. Featherboards

Using featherboards can be very helpful for stabilizing the wood as it enters the area of the bit.

Placing a featherboard vertically can help cut consistent depth dados and grooves, and featherboards can help prevent kickbacks.

21. ROUTER, EDGE TABLE (Horizontal Router Table MLCS #9767)

Much safer and more accurate than standing wide stock on edge.

Quickly and easily make mortise & tenon joinery, raised panels with vertical raised panel bits, moldings and picture frames.

21.1. Safety Precautions

a. INSPECT router bits for damage prior to use.

b. LARGER BITS run at slower speeds and require more HP.

c. NEVER touch router bits after use, as they may be extremely hot.

d. MAKE all adjustments with the router power switch in the OFF position, bit stopped and router unplugged.

e. DO NOT bottom out the bit in the collet or partially insert the bit. Instead, completely insert the bit, then back off approximately 3/8" to 1/2" and tighten collar securely.

f. NEVER start the router with the bit in contact with the stock.

g. KEEP workpiece against the fence or bit collar during cutting operation.

h. USE FEATHERBOARDS to support the workpiece against the router table.

i. DO NOT force workpiece into router bit.

j. KEEP hands and fingers 2" from bit.

k. ALWAYS feed material from the right side of the bit to the left side of the bit for cutting the outside edge of a workpiece.

l. ALL BITS in the Woodshop will require three to five passes dependent upon the type and size of the bit. Raise bit in 1/8" increments.

m. TAKE LIGHT CUTS. Heavy cuts invite kickback. If necessary, move the fence closer to the bit or switch to a larger guide bearing.

n. AVOID SHAPING SMALL STOCK: Instead, shape a larger piece and reduce it in size afterwards. If you must shape a small piece, build an appropriate jig or secure the work within the jaws of a wooden hand screw clamp.

21.2. Set-Up & Use – Edge Router Table

Taking several shallow passes will yield a better cut than trying to cut too aggressively which may lead to a poor cut quality or excessive tear-out.

21.2.1. Horizontal Table Specifications

- Micro adjustable bit height adjustments. 1/16" per turn allows for very precise adjustments: (1/4 turn = 1/64", 1/2 turn = 1/32", 3/4 turn = 3/64").
- Table is 24" wide x 20" deep x 25" height with surface extension fences, on both sides of the router plate give maximum support to long stock.
- Router plate is held in routing position by aluminum extrusions, along with two locking knobs which safely secure the sliding router plate in position.
- Raise your router up to 2-3/8" above the table.

21.2.2. Adjusting Bit Height

a. Loosen the two knobs that lock the router into place.

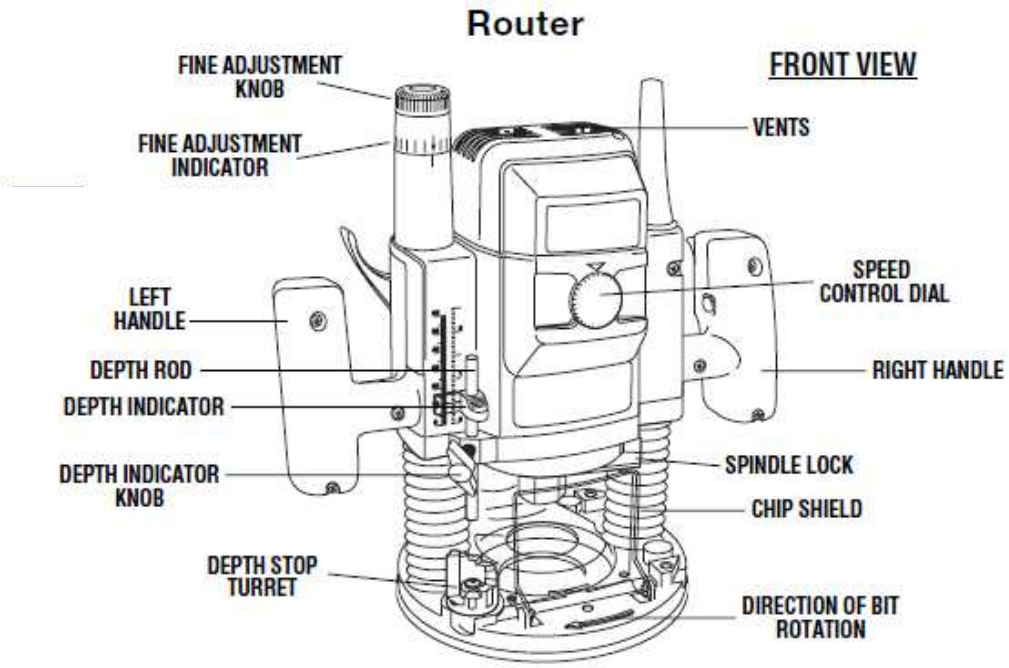
b. Turn the crank on the top of the assembly to raise and lower the router to desired position. One revolution equals 1/16”.

c. Tighten the two knobs that lock the router into place.

21.2.3. Adjusting Router Settings

The router is a 2 horsepower Bosch 1613EVS router with variable speed and fine adjustment knob.

To adjust the router or to install bits, just swing the horizontal table sideways for easy access to the router unit.



21.2.4. Changing Router Bits

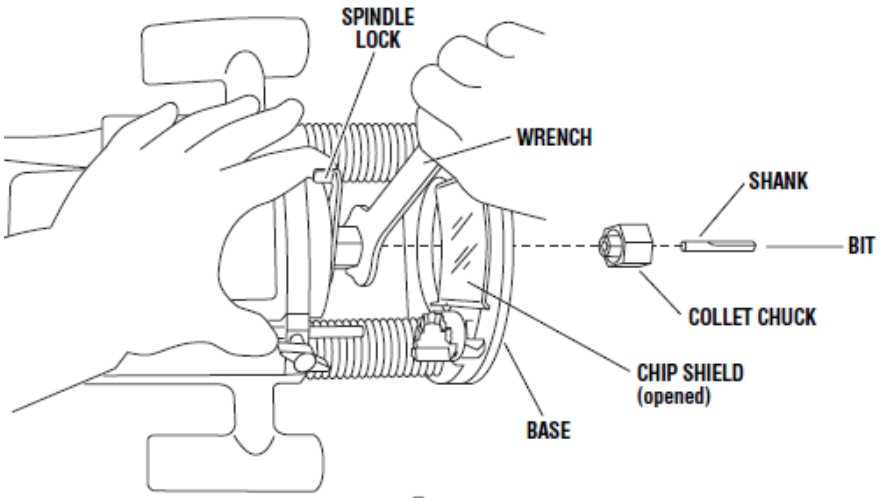
a. Press spindle lock to prevent rotation of collet chuck. NOTE: it may be necessary to rotate collet nut to engage spindle lock (Fig. 3).

b. Next, use the collet wrench to loosen the collet chuck assembly in counter-clockwise

c. direction (viewed from bottom of router).

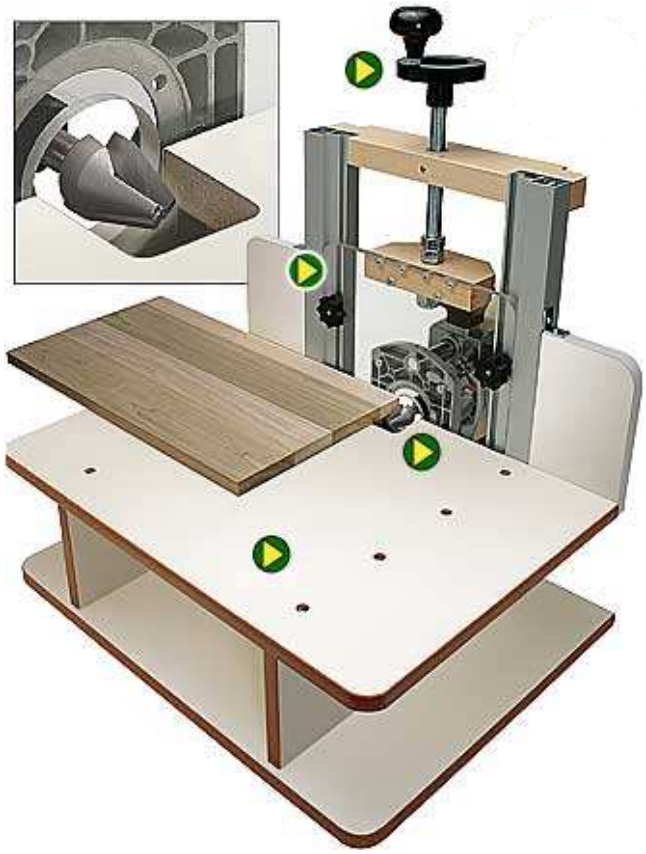
d. Insert the shank of the router bit into the collet chuck assembly as far as it will go, then back the shank out until the cutters are approximately 1/8" to 1/4" away from the collet nut face.

e. With the router bit inserted and the spindle lock engaged, use the collet wrench to firmly tighten the collet chuck assembly in a clockwise direction (viewed from bottom of router).



21.2.5. Routing the Workpiece

Normally, you feed a router opposite to rotation direction. This gives you just enough resistance to maintain control and avoid kickback.



When feeding a workpiece into the spinning bit of the router, you want to choose the direction that forces the bit to push the wood back against you. This direction changes depending on whether the bit is above or below the workpiece.

a. Bit BELOW workpiece:

- If the **BIT** is setup to cut **BELOW** the workpiece, feed from **LEFT to RIGHT**.
- Stock to be routed should move over the top of the bit using push pads to securely hold workpiece and protect your fingers.

b. Bit ABOVE workpiece:

- If the **BIT** is setup to cut **ABOVE** the workpiece, feed from **RIGHT to LEFT**.
- Be extra careful not to run your fingers under the spinning bit – keep a safe distance between your fingers and the bit.

22. SANDER, 6" BELT/12" DISK (Powermatic Model BD31A)

22.1. Safety Precautions

a. MAINTAIN at least 3" between fingers and the abrasive belt.

b. ALWAYS sand on the downward side of the disc so that the work is held securely on the table.

c. MAKE SURE belt is tracking correctly.

d. MAKE SURE the belt or disc abrasive surface is not torn or loose.

e. KEEP the table free of objects which might "walk off' during operation.

f. NEVER WEAR gloves or hold work with a rag when sanding.

g. DO NOT SAND very small or very thin workpieces that cannot be safely controlled. Loss of control of the workpiece can result in injury.

h. SUPPORT workpiece adequately during operation. Maintain control of work at all times.

i. ALWAYS use a backstop when using belt finishing machine in a horizontal position.

j. SHUT OFF machine and do not leave until it has come to a complete stop.

k. NEVER TURN THE MACHINE "ON" with the workpiece contacting the abrasive surface. Kickback can occur.

l. AVOID AWKWARD OPERATIONS AND HAND POSITIONS. A sudden slip could cause a hand to move into the abrasive disc or belt.

m. PROPERLY SUPPORT LONG OR WIDE WORKPIECES. Loss of control of the workpiece is dangerous.

n. NEVER PERFORM LAYOUT, ASSEMBLY, OR SET-UP WORK on the table/work area when the machine is running. A sudden slip could cause a hand to move into the abrasive surface. Severe injury can result.

22.2. Setup & Use – Belt/Disk Sander

The sanders are setup by the Maintenance Team. There is no setup for the general user.

23. SANDER, 1" BELT/8" DISK (Delta Model SA180)

The Woodshop has two of these machines.

23.1. Safety Precautions

a. DO NOT use sander on metal products.

b. MAKE SURE the sanding belt is tracking correctly.

c. MAKE SURE the sanding belt is not torn or loose.

d. ALWAYS HOLD work firmly when sanding.

e. NEVER TURN THE MACHINE "ON" with the workpiece contacting the abrasive surface. Kickback can occur.

f. AVOID AWKWARD OPERATIONS AND HAND POSITIONS. A sudden slip could cause a hand to move into the abrasive disc or belt.

g. DO NOT SAND very small or very thin workpieces that cannot be safely controlled. Loss of control of the workpiece can result in injury.

h. PROPERLY SUPPORT LONG OR WIDE WORKPIECES. Loss of control of the workpiece is dangerous.

i. NEVER PERFORM LAYOUT, ASSEMBLY, OR SET-UP WORK on the table/work area when the machine is running. A sudden slip could cause a hand to move into the abrasive surface. Severe injury can result.

23.2. Setup & Use – Belt/Disk Sander

Finish curves or odd-shaped work by removing the belt plate.

You can sand chamfers and bevels by tilting the aluminum tables on either the belt or disk sander.

24. SANDER, BELT (3x21" Craftsman 315.117131, Porter-Cable 352VS)

The Belt Sander is useful for sanding the surface and edges of pieces of wood that are too large to be sanded on the disc sander. The Belt Sander can be used on flat or curved pieces.

24.1. Safety Precautions

a. ALWAYS UNPLUG before changing abrasive belts.

b. SANDING OF LEAD-BASED PAINT IS NOT ALLOWED.

c. ADJUST TRACKING of the abrasive belt prior to sanding operation.

d. PRIMARY SAFETY HAZARD: Workers may catch their hands, clothing, or jewelry in the in-running rolls. Also, contact with an abrasive surface can cause abrasions and lacerations.

e. ALWAYS sand on the downward-moving side of the disk or belt.

f. WOOD splinters and chips may be thrown from the sanding action.

g. REPLACE torn, frayed, or excessively worn belts. A worn-out belt can cause massive heat buildup, which can cause it to tear or break and pelt the surrounding area with projected bits.

24.2. Setup & Use – Belt Sander

a. Make sure the dust collection bag is securely attached before sanding, AND make sure the dust collection valve is open to allow dust particles to be blown into the dust collection bag. After long periods of sanding, or when first using the tool, check to see if the dust collection bag needs to be emptied.

b. Start the sander above the material, then lower the sander so the back end makes contact first. Move the sander back and forth in a straight line for best results.

c. Work through the "grits". This is the process of sanding a workpiece by using progressively finer pieces of sandpaper to get a smooth finish. Each progressive piece of sandpaper removes the scratches from the previous sanding. Skipping grits to save time is not necessarily a good idea. You will often end up sanding longer just to remove the scratches left by the previous grit. This is more important with harder woods like maple than it is with softer woods like pine.

d. For better-looking results, always sand with the grain of the wood, especially with coarse sandpaper.

25. SANDER, EDGE (6" BELT KUFO Model SK-3000SD)

25.1. Safety Precautions

a. DO NOT use sander on metal products.

b. MAKE SURE the sanding belt is tracking correctly.

c. MAKE SURE the sanding belt is not torn or loose.

d. ALWAYS HOLD work firmly when sanding.

e. NEVER TURN THE MACHINE "ON" with the workpiece contacting the abrasive surface. Kickback can occur.

f. AVOID AWKWARD OPERATIONS AND HAND POSITIONS. A sudden slip could cause a hand to move into the abrasive disc or belt.

g. DO NOT SAND very small or very thin workpieces that cannot be safely controlled. Loss of control of the workpiece can result in injury.

h. PROPERLY SUPPORT LONG OR WIDE WORKPIECES. Loss of control of the workpiece is dangerous.

i. NEVER PERFORM LAYOUT, ASSEMBLY, OR SET-UP WORK on the table/work area when the machine is running. A sudden slip could cause a hand to move into the abrasive surface. Severe injury can result.

25.2. Setup & Use – Edge Sander

The sander has two adjustments the user can make:

- **Raise/lower the workpiece support table** to use a different part of the belt as it wears on one area.
    - There are two knobs under the support table which you loosen, being sure to support the table with one hand, adjust the table, and then retighten the two knobs.
- **Tilt the entire belt assembly** from its nominal 90 degree configuration to 0 degrees or horizontal position.
    - When facing the machine, below the belt level and on the right hand side is a single knob and a scale marked from 0 to 90 degrees. Securely hold the belt mechanism while loosening the knob, adjust to the desired angle and retighten the knob.
    - Please return the machine to the upright 90 degree position when finished sanding.

26. SANDER, RANDOM ORBIT PALM – PNEUMATIC (Campbell Hausfeld PL1565)

26.1. Safety Precautions

a. UNHOOK air hose before changing abrasive sandpaper.

b. VERIFY air pressure is set between 85-90 PSI.

26.2. Setup & Use – Pneumatic Air/Oil

Pneumatic tools need to receive a continuous supply of oil as well as air. In the Woodshop, that supply comes by routing the compressed air coming from the compressor through the black automatic oiler shown in this picture.

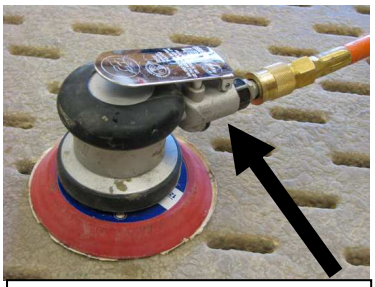
The blue device in this picture regulates the air pressure and it needs to be checked to make sure the pressure is set between 85-90 PSI before connecting the tool. There are several such setups in the Woodshop.

The picture shows the pressurized air and automatic oiler system located by the sanding table.

26.3. Setup & Use – Random Orbit Palm Sander

Sandpaper for these machines comes with adhesive backing. The old sandpaper can be easily peeled off, being sure to disconnect the air hose first. When installing the new paper, you should center the pad on the paper and press against the table.

NOTE: 5" Sandpaper is provided by the Woodshop for a nominal fee and is located in one of the cabinets, or you may buy and bring in your own supply.



Speed of sander is controlled by a switch under the hose inlet area

Sanding is best done on top of the sanding table, **with the table air system turned on** (the switch for this is on the side of the sanding table).

Let the sander to the work. It operates best if you guide the sander around your wood with very light pressure. Heavy pressure on the sander will wear out the sandpaper AND the pad faster, and will result in uneven sanding and premature replacement of the pad.

For best results, inspect and replace the abrasive sandpaper often for wear or damage.

27. SANDER, WIDE DRUM (Timesavers S311-13-1T)

The dual roller, single drum sander can sand wood up to 36" wide. The grit of the belt is 80, which is the grit we have on all the stationary sanders.

27.1. Safety Precautions

Members are required to attend a short class on the use of the sander. One cannot use it unless they have taken the class and have their name on the "APPROVED USERS" list at the Shop Monitor's desk.

a. **EMERGENCY STOP BAR** – If the unit needs to be stopped IMMEDIATELY during any operation, press the RED stop bar located across the front of the equipment at the infeed. Once stopped, lower the infeed table before attempting to remove the workpiece.

b. DO NOT SAND material shorter than 12", narrower than 3/4" or thinner than 1/8" thick.

c. DO NOT SAND very small or very thin workpieces that cannot be safely controlled. Loss of control of the workpiece can result in injury. If a workpiece is thinner than 1/8", you must use a backer board when sanding.

d. NEVER stand directly in line with either the infeed or outfeed sides. Stand to one side.

e. NEVER TURN THE MACHINE "ON" with the workpiece contacting the abrasive surface. Kickback can occur.

f. AVOID AWKWARD OPERATIONS AND HAND POSITIONS – NEVER place your hands directly at the front opening of the infeed. A sudden slip could cause a hand to move into the abrasive disc or belt.

g. PROPERLY SUPPORT LONG OR WIDE WORKPIECES. Loss of control of the workpiece is dangerous.

h. NEVER PERFORM LAYOUT, ASSEMBLY, OR SET-UP WORK on the table/work area when the machine is running. A sudden slip could cause a hand to move into the abrasive surface. Severe injury can result.

27.2. Setup & Use – Wide Drum Sander

The sander is to be used on **HARDWOODS only**. **Do not use the sander on PINE, SPRUCE, FIR, PAINTED WOOD, TREATED WOOD, PLYWOOD or any other soft wood** as these will leave material on the abrasive sanding belt and may negatively impact the project the next Woodshop member sands.

Further, **GLUE-UPS** must be scraped before sanding and they must be allowed to cure overnight before running them through the sander. It is also advisable to use the planer before using the sander on glue-ups. Glue that has not properly cured will be transferred to, and will cause severe damage to, the sanding belt.

27.2.1. Turn-On Procedure

a. Unlock the electrical switch box, and turn power ON. (See Shop Monitor for key)

b. Connect the black air hose and verify pressure is set to 85-90 lbs.

c. **CLOSE Main Vacuum Vent** at top of unit.

d. Open side access panel – Activate air pressure on Sanding Belt by pulling down on blue collar – Close access panel.

e. **Open Main Vacuum Vent** at top of Unit.

f. Place wood piece with spacer on top of in-feed table under the Red Bar. Use the Depth Wheel below side access panel to raise or lower in-feed table until spacer makes slight contact with Red Bar.

g. Remove spacer and workpiece.

h. Press the Red STOP button to reset – Press the Green START button to start.

i. Insert workpiece:

- Always feed the wood so the sanding is with the grain.
- Do Not Force-Feed the workpiece through the machine, let sander apply proper feed rate.
- You can adjust the conveyor feed speed on the sander with the round dial located to the lower left side of the front. Set dial at approximately 1/4 turn, around the 45 minute mark on a clock.

i. Turn Depth Wheel counter-clockwise **no more than 1/4 turn** for each subsequent pass until desired result is obtained.

27.2.2. Turn-Off Procedure

a. Press Red STOP button.

b. CLOSE Main Vacuum Vent at top of Unit.

c. Open side access panel – Release air pressure on sanding belt by pulling down on blue collar – Close access panel.

d. Turn Main Power Switch to OFF and lock.

e. Clean/vacuum any residual dust from the equipment and surrounding area.

28. SANDER, DRUM (Ryobi WDS1600)

28.1. Safety Precautions

You need to be careful to not stick your fingers into the sander.

a. DO NOT SAND MATERIAL thicker than 6", shorter than 6", narrower than 3/4" or thinner than 1/8" thick.

b. DO NOT SAND very small or very thin workpieces that cannot be safely controlled. Loss of control of the workpiece can result in injury. If a workpiece is thinner than 1/8", you must use a backer board when sanding.

c. NEVER stand directly in line with either the infeed or outfeed sides. Stand to one side.

d. NEVER TURN THE MACHINE "ON" with the workpiece contacting the abrasive surface. Kickback can occur.

e. AVOID AWKWARD OPERATIONS AND HAND POSITIONS – NEVER place your hands directly at the front opening of the infeed. A sudden slip could cause a hand to move into the abrasive disc or belt.

f. PROPERLY SUPPORT LONG OR WIDE WORKPIECES. Loss of control of the workpiece is dangerous.

g. NEVER PERFORM LAYOUT, ASSEMBLY, OR SET-UP WORK on the table/work area when the machine is running. A sudden slip could cause a hand to move into the abrasive surface. Severe injury can result.

28.2. Setup & Use – Drum Sander

TIP: lift the lid on this sander and note if there are any burn marks. If there are, don't feed your wood where those burn marks are.

The grit of the belt is 80, which is the grit we have on all the stationery sanders.

The sander is to be used on **HARDWOODS only**. **Do not use the sander on PINE, SPRUCE, FIR, PAINTED WOOD, TREATED WOOD, PLYWOOD or any other soft wood** as these will leave material on the abrasive sanding belt and may negatively impact the project the next Woodshop member sands.

Further, **GLUE-UPS** must be scraped before sanding and they must be allowed to cure overnight before running them through the sander. It is also advisable to use the planer before using the sander on glue-

up. Glue that has not properly cured will be transferred to, and will cause severe damage to, the sanding belt.

It is best with this sander to start with your piece on the side away from the motor housing, and then move it towards the housing and sand again. Depending on the width of your wood, you can do this several times before you lower the drum. If you do this, you can lower the drum more than the 1/4 turn. Remember to avoid feeding the wood where there are burn marks on the sanding belt.

a. Set the speed (round knob you twist) to 4 or a little less [never faster].
b. Turn the large hand-wheel until you can feel the belt touch the wood.
c. Turn the sander on (flip switch to towards the wall).
d. Start your wood through and lower the drum until you hear it sand the wood.
e. Send the wood through again.
f. If you need more sanding, lower the drum 1/8th to 1/4th turn (1/8th turn if the wood is over 2" wide, 1/4th turn if the wood is less than 2" wide) and start the wood again.

29. SANDER, OSCILLATING SPINDLE (Jet JOVS-10)

The primary use of a spindle sander is to sand inside radii. To sand flat surfaces or outside radii, use a belt sander or a disc sander.

The Woodshop has two of these machines, but each has a different spindle mechanism. The spindle sets are NOT interchangeable between the two sanders. For easy identification, one set has been painted read and the other set is not painted.

29.1. Safety Precautions

a. **CAUTION: When sanding an enclosed area (any workpiece that requires dropping over the top of the spindle), stop the machine, place the workpiece over the spindle, and hold the workpiece firmly on the table while restarting the machine. Stop the machine before removing the workpiece.**

b. SUPPORT workpiece adequately during operation. MAINTAIN control of work at all times.

c. DO NOT force machine. Allow machine to do the work for which it is designed.

d. REMOVE adjusting keys and wrenches before turning on sander.

e. THIS SANDER is for sanding curved workpieces and the interior of wooden rings. Choose the sanding drum and matching insert that best matches the size of the workpiece.

f. BE VERY CAREFUL when sanding small workpieces as the force of the spinning drum may pull the workpiece from your hands.

g. KEEP the table free of objects which might “walk off” during operation.

h. MAKE SURE table insert, if required, is installed prior to use.

i. NEVER TURN THE MACHINE “ON” before clearing the table/work area of all objects (tools, scraps of wood, etc.).

j. NEVER TURN THE MACHINE “ON” with the workpiece contacting the abrasive surface.

k. NOTIFY SHOP MONITOR WHEN SLEEVES BECOME WORN OR DAMAGED. A torn or damaged sleeve could be unexpectedly expelled from the machine if not replaced by the Maintenance Team.

l. PROPERY SECURE SANDING DRUM on spindle before operating.

m. HOLD WORKPIECE FIRMLY ON THE SANDER TABLE. To prevent loss of control, use a solid grip.

n. INSPECT MATERIALS FOR DEFECTS. Loose knots and splinters can be thrown from the machine with great force. Make sure defective materials are not used on this spindle sander.

o. FOREIGN OBJECTS SUCH AS NAILS AND STAPLES must be removed before sanding.

p. AVOID AWKWARD OPERATIONS AND HAND POSITIONS. A sudden slip could cause a hand to contact the abrasive sleeve.

q. ALWAYS FEED WORKPIECE AGAINST the direction of the sanding belt rotation.

29.2. Setup & Use – Oscillating Spindle Sander

NEVER PERFORM LAYOUT, ASSEMBLY, OR SETUP WORK on the table/work area when the machine is running. A sudden slip could cause a hand to move into the abrasive surface.

29.2.1. General Usage Steps

This sander is to be used with **WOOD and WOOD ONLY**.

a. Move workpiece into machine rotation (counterclockwise) for best workpiece control.

b. Keep the workpiece in contact with the sander and moving at all times.

c. Hold the workpiece firmly on the table at all times.

d. Select a spindle that matches the workpiece. In general, the largest diameter spindle that fits your workpiece is the best selection.

e. Always use a table insert ring appropriate for the spindle being used.

f. CAUTION: When sanding an enclosed area (any workpiece that requires dropping over the top of the spindle), stop the machine, place the workpiece over the spindle, and hold the workpiece firmly on the table while restarting the machine. Stop the machine before removing the workpiece.

g. Use the rubber eraser provided by the Woodshop to remove sanding debris from the sandpaper during sanding operations. This will preserve the sandpaper's efficiency.

29.2.2. Changing Spindles – Mechanical Overview:

To change a spindle, it is helpful to become familiar with the mechanic of the spindle mount. The spindle arbor base consists of three sections, the hex nut at the top of the base, a tapered mid section, and a threaded bottom. The *arbor nut* is used to tighten or loosen the arbor, the taper is used to accurately and consistently position the arbor, and the thread is for the purpose of securing the arbor in

place. The spindle arbor seats into the main drive shaft and that drive shaft is secured in position by two nuts, referred to as *jam nuts*.

29.2.3. Removing a Spindle:

a. Select a wrench end with a hole near the throat and lock onto the *arbor nut*. Using the opposite end of another wrench, lock onto the *top jam nut*. Turn the *arbor nut* counterclockwise while holding the *top jam nut* in place until the arbor turns freely.

b. Remove the arbor by hand and place in the storage rack of the same machine that the arbor was removed from.

29.2.4. Inserting a Spindle:

a. Select a spindle for replacement from the same machine's storage rack. (*NOTE: Spindles are not interchangeable between machines*)

b. Examine the taper on the arbor base and the drive shaft for cleanliness.

c. If either requires cleaning, wipe both with a paper towel and lubricate with one drop of anti-seize lubricant on the arbor taper.

d. Hand tighten the clean spindle into the drive shaft until no discernable wobble can be felt.

e. If the arbor cannot be sufficiently tightened by hand, select a wrench end with a hole near the throat and lock onto the arbor nut. Using the opposite end of another wrench, lock onto the bottom jam nut. Turn the arbor nut clockwise while holding the bottom jam nut in place until the arbor no longer wobbles.

f. **Do not over tighten spindles.** The natural rotation of the machine and the resistance created from sanding creates a self tightening condition.

g. Select a table insert ring appropriate for the spindle being used.

29.2.5. Changing Sander Table Angle:

a. Loosen the lock knobs on the trunnions on each side of the under table.

b. Position the table to the desired angle.

c. Retighten the lock knobs.

d. **ALWAYS** return the table to the 90 degree stop when finished.

29.2.6. Replacing Worn Sanding Drums:

This is a maintenance issue and may only be done by the Maintenance Team. If sanding drums need to be changed, bring the issue to the attention of the Shop Monitor.

30. SHAPER (Seco SK-28SP)

NOTE TO USER: This Section is still being reviewed/edited and will be updated in a future revision

Shapers are built stronger and heavier to swing a larger cutter than any router will handle. A shaper is used for running straight molding, raising panels, pattern cutting, and doing radius work.

30.1. Safety Precautions

PRIOR TO USING SHAPER, SHOP MONITOR MUST BE NOTIFIED FOR ANY SPECIAL INSTRUCTIONS.

a. Only those on the "Approved Shaper Users" list may use this machine. Once you have signed up for and completed the hands-on training class, your name will be put on the list.

b. Always turn power OFF and wait until cutter bit stops turning before adjusting or changing set-ups and when changing cutter rotation direction.

c. Select straight-grained, defect-free material for use on the shaper.

d. Use one of the following methods to hold workpiece:

- **When starting a freehand cut, YOU MUST HOLD THE WORKPIECE AGAINST THE STARTER PIN and then feed it into the cutter. NO other types of freehand cuts are allowed.**
- If workpiece is shorter than 12", always have the workpiece moved through the machine by a fixture or sled of some sort. User must never attempt to use hands to hold the wood being worked. The shop has several different fixtures for this purpose.
- If workpiece is 12" or longer, you may use the fence. Hold work firmly against the fence with appropriate holding devices such as magnetic holdovers, appropriate sleds, featherboard, etc.
- Whenever possible, use hold-downs to keep the workpiece in position during cutting.
- When shaping the ends of workpieces, make sure the ends are held in a sled or fixture.

e. Use only operations and workpieces which permit the operator's hands to remain at least 8" from the cutter head.

f. DIRECTION OF FEEDING WORK: FEED THE WORKPIECE **into** cutter rotation direction or workpiece will shoot out like a missile. Should you reverse the cutter, the feed direction will also be from the opposite direction.

g. DO NOT ATTEMPT TO REVERSE YOUR DIRECTION ONCE CUTTING OPERATION HAS BEGUN. CHANGING DIRECTION CAN RESULT IN INJURY, THROWN MATERIAL, OR JAMMING OF THE CUTTER HEAD.

h. MAKE SURE the cutters are sharp.

i. Bottom of shaper cutter must be set in alignment as is proper for that cutter. When changing the cutter and after installation, the Shop Monitor, or a knowledgeable member of the shop, must be called to check out the installation.

j. Shaper Speed is set at 9000 RPM. Do not attempt to make a change to rotation speed.

k. USE proper Eye Protection and a Dust Mask.

l. DO NOT WEAR TIE, GLOVES, or loose clothing. REMOVE WATCH, RINGS, and other jewelry. ROLL UP SLEEVES.

m. NEVER TURN THE MACHINE "ON" before clearing the table of all objects (tools, scraps of wood, etc.).

n. AVOID AWKWARD OPERATIONS AND HAND POSITIONS where a sudden slip could cause a hand to move into the cutter.

o. NEVER START THE MACHINE with the workpiece contacting the cutter.

p. DO NOT FEED A WORKPIECE that is warped, contains loose knots, or is embedded with foreign objects (nails, staples, etc.). Workpiece must be flat and square, with reference surface marked in cases where two ends are intended to be cut.

q. PROVIDE SUFFICIENT BEARING SURFACE when shaping with a starting pin and collar(s).

r. ONLY SHAPE LARGE WORKPIECES when using starting pin and collar(s). DO NOT SHAPE short or light workpieces when using starting pin and collar(s).

s. POSITION THE CUTTER below the collar(s) when shaping with starting pin and collar(s).

t. PROPERLY SUPPORT LONG OR WIDE WORKPIECES.

u. NEVER PERFORM LAYOUT, ASSEMBLY or setup work on the table/work area when the machine is running.

30.2. Setup & Use – Shaper, General Information

The shaper is pretty much just a large router, with more power, and the ability to handle much larger cutters, such as those used for raised panels or crown moldings. The variety of cutters is also much greater that those for routers.

Shapers are able to run in reverse, which is necessary in performing some cuts. It is very important to always check the position of the directional switch. Feeding a board into a shaper that is turning the wrong direction could result in the board leaving the machine like a missile. It could be FATAL if the board were to hit somebody or could result in operator loosing fingers.

The shaper, like some of the other Woodshop equipment, is a dangerous machine, but with proper precautions and careful set-up it doesn't need to be feared. There are several safety precautions you can, and should, use.

- Bearings can be used to support and align the workpiece and are installed above or below the cutter. This alone would stop many of the injuries attributed to the shaper.
- Jigs and fixtures are also a big help in reducing injury, and generally result in better cuts. The time spent to make them is well worth the effort.
- A very small device, but important one is the starter pin supplied with the machines. This is simply a metal rod, threaded on one end which screws into a hole located a few inches away from the cutter. Holding the work piece against the starter pin, and then feeding it into the cutter is the proper way to start a freehand cut.
- Instead of trying to shape narrow pieces, shape wide pieces and then rip them.
- Use a miter gauge, on end grain with a backer board to prevent tearout as the board leaves the cutter.
- On panels, such as raised panels for doors, shape the end grain first and then the edges parallel to the grain. This way any tear out on the end grain will be shaped off when you shape the edges.
- Make several shallow cuts instead of trying to make large moldings in one pass.

With some caution, careful planning, and common sense, injuries from this machine can be avoided. As always, if it doesn't seem safe, DON'T DO IT.

30.3. Setup & Use – Shaper, Making Finger Joints

The shaper setup is a precision operation requiring precision squares and various jigs.

The setup is different for each type of cut you are interested in performing. The variations are too voluminous to be spelled out here. This section provides a detailed procedure for doing finger joint cuts on the ends of two short boards. This operation allows using boards over 18” to be joined together to

make longer boards, up to a length that you have a clamp available to use for gluing. The principles described here can be adapted to do any sort of cut you need to do. If these instructions are not clear to you, consult one of the other members on the 'Approved User' list for the shaper.

In order to get a good fit and strong joint, it is critical that this procedure is followed exactly. Also, since these boards need to be perfectly square, etc., you must check each machine you use for squareness, especially the fence on the jointer and the rip sled of the table saw. They are seldom set properly.

30.3.1. Prepare Your Wood

Prepare your wood by selecting pieces a minimum of 18" long. This is necessary to be able to clamp them properly on the shaper. If you need shorter boards, you can finger joint both ends of an 18" board, then cut them to length before gluing.

In order to prepare the wood, first flatten one side on the jointer. Then plane the second side (you really only need the bottom side to be flattened). Next, joint one edge on the jointer. Mark clearly on the jointed edge and flattened bottom, with the mark "ref". For a more detailed explanation, see ***Section 4.2 How to Prepare a Board, or Getting Started***.

Now, rip the second edge on the table saw, then cut it to length keeping it very square.

Using the precision square in the first cabinet above the miter saw, check your piece for square edges and ends.

30.3.2. Cutter Installation

a. Be sure the shaper is not plugged in.

b. Find the finger joint cutter in the "shaper cutters" drawer in the tool room.

c. Bring over the sled from the tool room. Put on rods on the front of the shaper having the clamp on the right side. Clamp a workpiece under the clamp.

d. Raise the cutter spindle all the way to the top.

e. On the right side of the shaper, push the orange handle in to lock the cutter spindle. This often takes some time and several attempts if the cutters are in a low position. Get the dedicated double ended wrench from the drawer marked "Shaper Stuff". Put the smaller wrench end on the top nut. Turn it clockwise to take it off. (it is a LEFT HAND thread). Next put the larger wrench end on the lower nut. Turn it counter clockwise to take it off (it is a normal, RIGHT HAND thread).

f. Place an appropriate spacer or collar (if needed) at the base of the spindle for support.

g. Place the cutter on the spindle. Make sure the rotation is correct for your application and being sure that the bottom of your workpiece is below the lowest cutter finger when the workpiece is against the fence.

h. Place the spindle washer on top of the spacers/cutter and thread on the locknut.

i. Tighten the nuts while holding the spindle stationary.

j. Now, pull out the orange handle.

30.3.3. Setting up the Fence

Now take the precision square and be sure the aluminum fence is square with the slot in the shaper table. Use the setup jig tied to the vacuum to do this. The setup jig fits in the table slot to make accurate squareness possible.

If it is not square, remove the clamp on the sled and open the small clamp handle, square up the sled, check again and retighten solidly.

Lastly, recheck again to be sure the sled is square.

30.3.4. Setting the Depth of Cut

Bring over a steel straight edge. Bring a finger to the front, then put the straight edge in the bottom of a finger after first putting a piece of masking tape on the edge of the straightedge.

Set the fence so that it is about 1/16 in back of the straightedge, parallel to the edge of the work piece, on both sections of the fence. It is important that the two halves of the fence are: aligned to each other, parallel to the slot in the table and a minimum of 1/32 beyond where the finger will cut.

Now lock up depth control and turn on/off switch to “on”.

30.3.5. Setting up the Sled

Put your workpiece on the sled (two “ref” surfaces down and against the fence back).

Insert chip breaker against fence and apply squeeze clamp to ensure the chip breaker is held tight. Move the sled to the right so you can feel the tightness of chip breaker and be sure it is tight.

After first loosening clamp on its post so it can be raised, push your wood to the fence (not hard to the fence). Lower clamp down, tighten it on its post and be sure when you pull back on the clamp lock, it pulls hard.

Lastly, check to be sure you can rotate the cutter by hand. If not, retract the orange handle and try again.

30.3.6. Setting Cutter Height

Put the setup gage on the sled. Then, raise the cutter until you can fit the gage perfectly into the fingers on the cutter, then lock the wheel that raises and lowers the cutter. **Be sure it is locked hard.**

30.3.7. Making the Cuts

Turn on the machine and make all of your cuts only on one end of the board. Be sure your fingers are a full depth of 7/16”. If not, your setup wasn’t such as to allow a full depth cut. Reset fence, cut off fingers and try again. Put the precision square on your piece to be sure the fingers are perfectly square to the

“ref” edges. Also, check it with the bottom of one female finger. If edge is not square, the fence locks are not holding.

After cutting this pattern on all work pieces, use second side of setup jig to set cutter to do the other end. Raise or lower cutter to fit perfectly into the setup jig. Use uncut end of chip breaker. Put the wood in the jig, referenced properly, and cut the second (uncut) end with fingers. Check the fit between the two pieces. See that the finger fits are right, lining up perfectly on the “ref” faces. Now make all your other boards and you are finished.

30.3.8. Finishing Up

To finish up, return “setup jig” to hanging near the blowpipe, raise spindle up and engage the orange spindle lock handle to lock the spindle. Use the crescent wrench to remove the top nut by turning it clockwise. Next, remove the lower nut by turning it counter clockwise. Remove cutter and put away, replace all spacers and nuts (finger tight) and cleanup. Remove sled and put in tool room on the floor.

31. STAPLER – PNEUMATIC (Grizzly Model G6042, Porter-Cable NS150A)

(NOTE: Portions of the information presented in this section were taken from the Grizzly Operating Manual.)

The stapler is designed to install 1/4 crown staples of various lengths from 5/16" to 1" (8 to 25 mm) long. This stapler is used to fasten thin workpieces.

31.1. Safety Precautions

a. **CAUTION: Keep tool pointed away from yourself and others at all times.**

b. Disconnect the tool from air supply before clearing jams, performing repairs, and during non-operations.

c. Do not keep the trigger pulled on safety yoke mechanism when carrying or holding the tool.

d. Never carry the tool by the hose or pull the hose to move the tool.

e. Operating this stapler can propel objects into the air, causing immediate eye damage. To protect yourself, you should wear safety glasses or goggles when operating this equipment.

f. This stapler discharges at 85-90 decibels. To protect your hearing, you should wear ear protection when operating this stapler.

31.2. Setup & Use – Pneumatic Air/Oil

Pneumatic tools need to receive a continuous supply of oil as well as air. In the Woodshop, that supply comes by routing the compressed air coming from the compressor through the black automatic oiler shown in this picture.

The blue device in this picture regulates the air pressure and it needs to be checked to make sure the pressure is set between 85-90 PSI before connecting the tool. There are several such setups in the Woodshop.

The picture shows the pressurized air and automatic oiler system located by the sanding table.

31.3. Setup & Use – Stapler

31.3.1. Safety Yoke Mechanism

A safety yoke mechanism (bump fire) on the nose of the stapler acts as a secondary safety device. When the trigger is pressed, the stapler will not fire until the safety yoke mechanism is depressed.

Before you use your stapler for the first time, check the safety yoke mechanism to ensure proper function. To do this:

a. Make sure the stapler is disconnected from the air supply!

b. Make sure the magazine is empty and contains no staples.

c. Make sure the trigger and the safety yoke mechanism move up and down without sticking.

d. Connect the stapler to the air supply.

e. Without pressing the trigger, depress the safety yoke mechanism against a scrap piece of wood that is clean and free of any knots, staples, or other foreign objects. If the stapler does not fire, then the safety yoke mechanism is working correctly. If the stapler does fire when you do this, immediately disconnect the stapler from the air supply and notify the Shop Monitor.

f. Similarly if the stapler fires when the trigger is pulled, without the safety yoke mechanism being depressed, then the stapler is not working properly. If the stapler does fire, immediately disconnect the stapler from the air supply and notify the Shop Monitor.

31.3.2. Loading Stapler

a. Disconnect the air supply from the stapler!

b. Push the magazine latch in the direction shown in ***Figure 1***.

c. Pull back the magazine cover until it stops.

d. Point the stapler up and insert a stick of staples into the magazine as shown in ***Figure 2***. Make sure that the pointed ends of the staples point in the same direction as the stapler nose piece.

e. Push the magazine cover forward until the magazine latch locks in place.

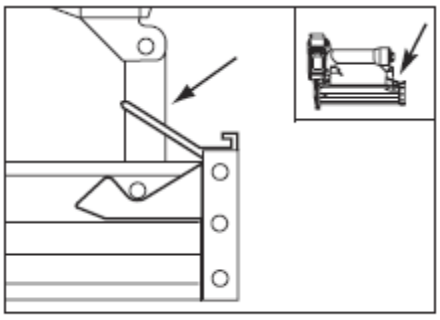


Figure 1. Releasing magazine latch.

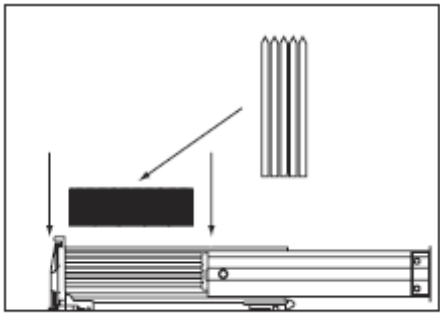


Figure 2. Loading staples into stapler.

31.3.3. Operating Stapler

To operate your stapler:

a. Connect the air supply to the quick connect fitting.

b. Test the loaded stapler for proper penetration. Hold the stapler perpendicular to the surface of a piece of clean scrap wood that is thick enough for the length of staples you have loaded. Depress the safety yoke mechanism on your workpiece.

c. Before pressing the trigger, make sure your free hand is positioned out of the way of a potential path of a staple in case of deflection. (Deflection is caused when the staple changes its path, resulting in the staple puncturing the surface of the workpiece as shown in ***Figure 3***.) Besides damaging your workpiece, deflection can cause injury if your free hand is securing the workpiece in the location that the staple deflects.

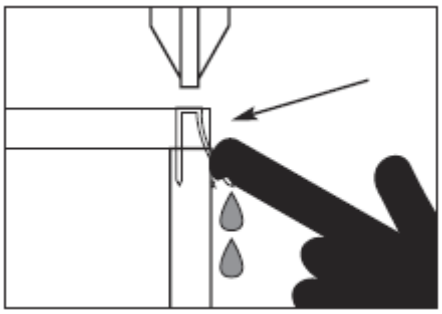
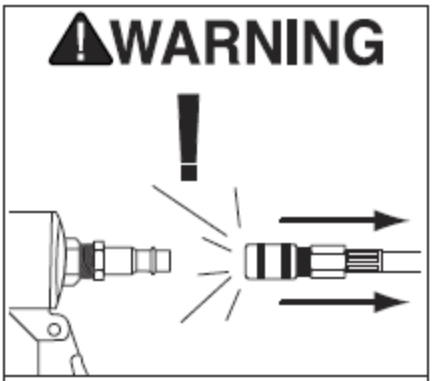


Figure 3. Example of staple deflection.

d. Press the trigger. If the staple drove into the wood far enough, continue with your intended operations. If the staple either went too far or not far enough, then adjust the air pressure. More air pressure will make the staple go deeper and less air pressure will decrease the staple penetration.

31.3.4. Clearing Jammed Staples

The most frequent situation with any type of stapler is a staple jam. A jammed staple must be cleared before using the stapler again. The two places where a staple can get jammed are the magazine and the discharge area.



Always disconnect air from stapler whenever clearing a jammed staple!

To clear a jammed staple from the magazine:

a. **Disconnect the stapler from the air supply!**

b. Open the magazine cover and pull the magazine all the way back.

c. Locate and remove the jammed staple with a pair of needle nose pliers. Close the magazine cover so it latches.

To clear a jammed staple from the discharge area:

a. **Disconnect the stapler from the air supply!**

b. Remove all of the staples from the magazine.

c. The jammed staple should now be visible; remove it from the discharge area with needle nose pliers.

d. Replace the staples. Push the magazine closed and snap the quick release latch back into operating position.

32. Gluing

Always remember to clean up the glue bottle & any glue droppings with a wet rag.

32.1. Glue Information

The Woodshop supplies one type of glue for all members to use. There is no charge for the use of all the glue you need in the shop; the funds for the glue are supplied from our yearly dues. The glue is found in the cabinets over the sink.

Adhesive type	Best use	Total Assembly Time	Strength rating (in PSI)*	Shelf life (years)
Titebond II (weather proof)	Exterior wood projects where water resistance is important. Interior projects that may come in contact with food and water	15 minutes	3750	2

*Depending on species, most wood will fail before the adhesive.

Titebond II Premium Wood Glue is a one-part wood glue that passes the ANSI Type II water-resistance specification. It is ideal for interior as well as exterior woodworking projects, including outdoor furniture, birdhouses, mailboxes, planters and picnic tables.

Titebond II Premium provides a strong initial tack, fast speed of set, superior strength and excellent sandability. It is FDA approved for indirect food contact (cutting boards).

This glue is:

- Good for all types of wood
- Goes on easy
- Excess can we wiped off as you put it on
- Excess can be scraped off after it has dried overnight

32.2. Application Guidelines

Application temperature: Above 55°F.

Open assembly time: 5 minutes (70°F./50%RH)

Total assembly time: 10-15 minutes (70°F./50%RH)

Required clamping pressure: Enough to bring joints tightly together (generally, 100-150 psi for softwoods, 125-175 psi for medium woods and 175-250 psi for hardwoods).

Methods of application: Plastic bottles for fine applications; glue may also be spread with a roller spreader or brush.

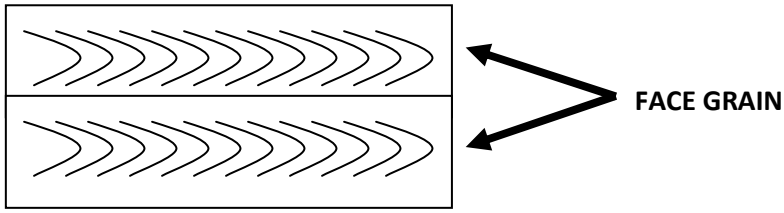
Cleanup: Damp cloth while glue is wet. Scrape off and sand dried excess.

Gluing Tips:

- More is not better - Excessive amounts of glue will cause imperfections in staining of the finished project, even if the area has been cleaned with a damp cloth.
- If you clamp the wood, it is best if you have paper between the clamps and the wood as this will ensure rust stains are not transferred from the clamps to your project.
- You must keep the work table clean by putting paper between your project and the table.

When gluing two pieces of wood together:

- Face Grain patterns should be going in the same direction (below)



- Alternate cup patterns of End Grain to prevent future warpage (below)

- Minimum recommended clamp time for small projects (wood of 3/4" or less) is 1/2 hour.
- You may begin minimal work without stressing the glue bond in 2 hours.
- No glue project may be run through the sanders until it has dried overnight (or at least for 4 hours) so that you do not gum up the sanding belts. Glue that has not properly cured will be transferred to the sanding belts, which will damage the equipment and cause wood burns for you and for the next users of the sander.
- Full strength time for the glue is 24 hours (per Manufacturer).

32.3. Glue-up Identifying Information Required

When you glue and clamp, you must stow your materials out of the way, and you must leave the following information on a piece of paper taped on the wood (especially important if you leave the shop while your glue is setting up) – information that includes:

1) Your name
2) Your phone number
3) An indication as to when the clamps can be taken off (no longer than 4 hours after clamping)
4) An indication as to when you left the shop and when you plan to return